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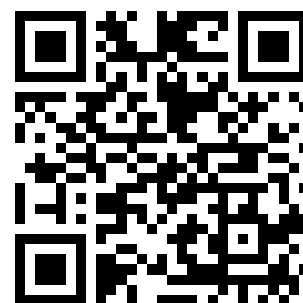
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Radio

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RADIO WORLD

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*Vol 1
April-Sept
1922*

RADIO PRIMER

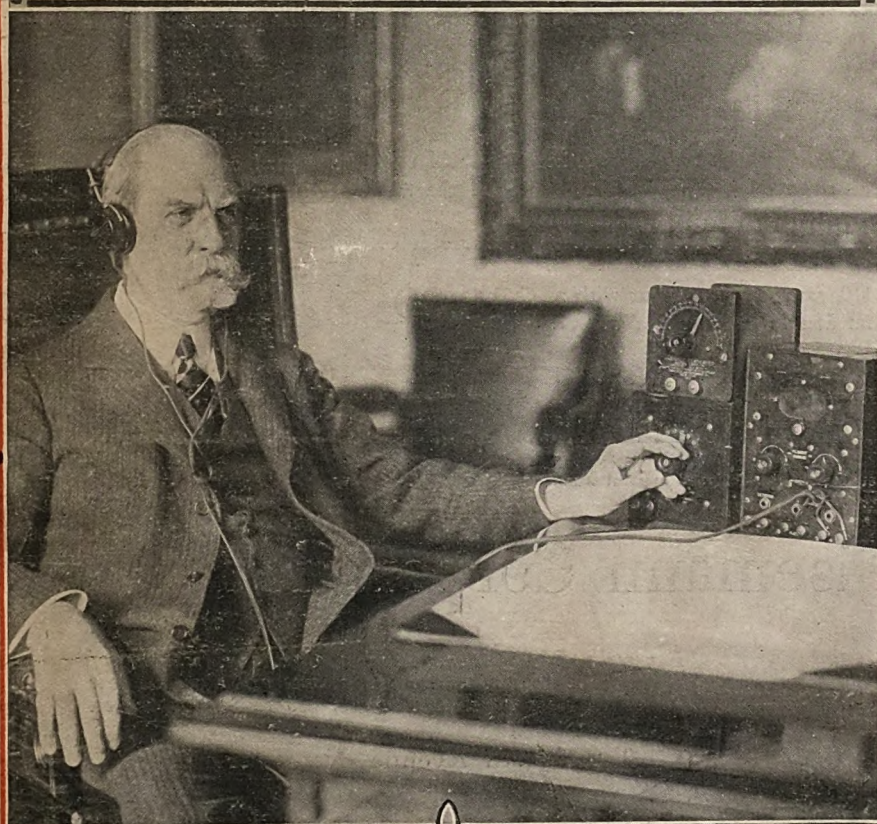
For
Beginners
Starts
In This Issue

SPECIAL ARTICLES

by
O. C. Roos (Fellow I. R. E.),
Fred. Chas. Ehlert, E. L. Brag-
don, Emerson Gaige, and others,
including Radio World's staff of
experts.

See illustrated article on 2nd
Annual Radio Show

Many technical and human
interest pictures.



RADIO AT THE STATE DEPARTMENT

Secretary of State Hughes using a government receiving set at his desk
in the State Department at the Capitol, Washington, D. C.,
Reproduction of a special pose taken while Secretary
Hughes was actually listening in.—

(c. by Keystone View Co.)

The "MARVEL" OF RADIO

Have You a Marvel in Your Home?

The "MARVEL" is the lowest priced complete crystal wireless telephone receiving outfit on the market having a wave-length range of 180 to 2600 meters. It sells complete all ready for installation for the small sum of \$15.00. It can be set up by anyone all ready for operation in 20 minutes. Not one additional part to purchase. No previous knowledge of wireless necessary—no license, batteries or source of current whatever needed. This \$15.00 "MARVEL" is the junior wireless telephone receiving set of other sets made by the Freed-Eisemann Radio Corporation, and selling up to \$5,000.00. Although the junior as we say, it is made in the same workman-like manner and of the same tested and proved material as the higher priced Freed-Eisemann apparatus.

The complete outfit, model 105, consists of a "MARVEL" highly efficient receiver, mounted in a handsomely finished mission oak cabinet, 150 feet of solid copper wire for antenna, 25 feet of insulated wire, 5 porcelain insulators, a 1,000 ohm telephone with leather covered headband and a telephone cord, antenna switch, ground clamp, extra "MARVEL" Radio crystal, codechart, abbreviation chart, and complete simple instructions for installation and operation. **\$15.00**

Model 110, same as above, but with a 2,000 ohm double headset **\$18.00**

DEALERS: We have some interesting information for you on these nationally advertised outfits. Write us to-day.

Built by the same engineers who designed apparatus now used by the U. S. Navy

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Formerly Radio Manufacturing Company, makers of Highest grade government and commercial high and low power wireless apparatus. From \$15 to \$5,000 per set.

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Dept. RW

\$15.00
COMPLETE



RADIO WORLD

[Copyright, 1922, by Radio World Co., New York, N. Y.]

A WEEKLY PUBLICATION, PUBLISHED EVERY WEDNESDAY AND DATED SATURDAY BY RADIO WORLD COMPANY, FROM PUBLICATION OFFICE, 1493 BROADWAY, NEW YORK, N. Y.

Vol. I. No. 1.

April 1, 1922

15c. per copy, \$6.00 a year

Radio World's Salutation

Radio, in all its varied and marvelous aspects, is the most widely discussed thing in the world today.

Progress in radio is so great and all-absorbing that it is impossible to keep up with it in anything except a weekly publication devoted entirely to this one subject—Radio.

Hence—RADIO WORLD, the national illustrated weekly.

It is perfectly obvious that a weekly newspaper, fresh off the press every seven days and up to date in all its departments, and appearing on the newstands within sixty hours after last page is closed, is required in a field that has grown so immeasurably during the past ninety days and which is by all odds the most interesting scientific and business proposition of the day.

RADIO WORLD, the only weekly in this wonderful department of business, scientific and amusement activities, is published for the purpose of supplying an immediate need. RADIO WORLD will be profusely illustrated, and will be for sale on all news-stands.

RADIO WORLD will cover thoroughly from week to week, all those matters affecting radio fans, as well as the more highly specialized interests represented by the dealers in and manufacturers of radio goods.

Here are some of the regular departments of RADIO WORLD, some of which are in this issue, others to be added immediately:

A Primer for Beginners, Problems Solved, Tips to the Fan, Question and Answer Dept., News and Gossip of Radio Societies and Clubs, Radio Merchandising, Arguments for Radio Salesmen, How to Correct Your Troubles, New Inventions, News From Foreign Lands, Weekly Broadcasting Programs, Radio Personalities, etc., etc.

In addition there will be special articles of interest and value from men who know their business and who know how to express their ideas.

A special effort will be made to guide the hundreds of thousands of new enthusiasts who have begun the study and practice of radio, and who are coming into the game hour by hour. These newcomers form a tremendous army of men, and women, too, who will want instruction, advice, and friendly help. We place RADIO WORLD at their disposal. Our Editor and contributors will endeavor to assist these beginners, as well as to cater to the wants and interest of that legion already engaged in the fascinating science and pastime. We pledge ourselves to do our best to be helpful, while not forgetting that it is necessary also to be interesting at the same time.

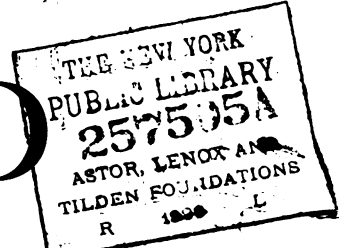
This makes a pretty big order for RADIO WORLD, but we accept it with the knowledge that such a paper is needed, that we have the experience, the knowledge, the confidence and the ambition that count for so much if success is to wait on intelligent effort.

RADIO WORLD is to be a weekly paper of service to the radio public, the manufacturer, the jobber, the dealer, and everybody interested in the eighth wonder of the world.

THE EDITORS.

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Radio



Maj.-Gen. Geo. Owen Squier

Chief Signal Officer of the U. S. Army and Friend of the Radio Amateur

GEORGE OWEN SQUIER, Maj.-Gen. and Chief Signal Officer of the U. S. Army, was born at Dryden, Mich., March 21, 1865. He was graduated from the United States Military Academy, West Point, N. Y., in 1887 and was then appointed second lieutenant in the 3rd Artillery; appointed first lieutenant, June 30, 1893; commissioned captain, United States Volunteer Signal Corps, May 20, 1898; lieutenant colonel, United States Volunteer Signal Corps, July 18, 1898; honorably discharged from volunteer Signal Corps, December 7, 1898; first lieutenant, Signal Corps, United States Army, February 23, 1899; commissioned captain, United States Volunteer Signal Corps, April 17, 1899; honorably discharged from Volunteer Signal Corps June 30, 1901; commissioned captain, Signal Corps, United States Army, February 2, 1901; major, Signal Corps, United States Army, March 2, 1903. Commanded United States Cables Ship Burnside, 1900-2, during laying of Philippine cable-telegraph system; delegate to International Radio Telegraphic Conference held in London, England, 1912; United States Military Attache at London, England, 1912-1916, when he was recalled to organize the air service of the army.

On February 14, 1917, he was appointed Chief Signal Officer of the Army, with the rank of Brigadier General; he was appointed Major General, Signal Corps, United States Army, October 6, 1917. Served as representative of the War Department and technical advisor to the American Delegation at the Interna-

tional Conference on Electrical Communications, Washington, 1920; represented the Department of State at the sessions of the Provincial Technical Committee of the International Conference on Electrical Communications, Paris, 1921; designated an Expert Assistant to the American Commissioners representing the Government of the United States at the Conference on Limitation of Armament, Washington, 1921; appointed an ex-officio member, representing the War Department, of the United States National Committee, International Electrotechnical Commission.

Soon after his graduation from West Point in 1887, General Squier was sent for duty to Fort McHenry, at Baltimore. While there, he looked around to see how he could best employ his time. Physics was his popular delight and he soon found that the greatest physicists in this country were close at hand—in Johns Hopkins University. For four years he attended Johns Hopkins and studied under the great scientists Rowland, Remsen, and Newcomb, and not only made lasting friendships with these men, but also laid the foundation for the inventions that have brought him to the front of the world's scientists.

Among some of the important contributions that he has made to science are his researches in the electrochemical effects due to magnetization, the sine wave system of telegraphy and ocean cabling, the polarizing photo-chronograph, tree telephony and telegraphy, multiplex telephony and telegraphy over open circuit bare wires laid in the earth or sea. He

is probably best known for his invention of "line radio" popularly known as "wired wireless" which made multiplex telephony possible and ranks as one of the great inventions in telephony.

In 1896 the City of Philadelphia, acting on the recommendation of The Franklin Institute, awarded the John Scott Legacy Medal and premium to him, for the polarizing photo-chronograph, and in 1912 The Franklin Institute awarded to him its Elliott Cresson gold medal, then the highest award of its gift, for his work in multiplex telephony and telegraphy or "wired wireless."

On April, 1919, General Squier was elected a member of the National Academy of Sciences in recognition of his contributions to science. May, 1919, he was awarded The Franklin Medal, by The Franklin Institute, Philadelphia, Pa., in recognition of his valuable contributions to physical science, his important and varied inventions in multiplex telephony and telegraphy and in ocean cabling, and his eminent success in organizing and directing the Air and Signal services of the United States Army in the World War. July, 1919, he was decorated with the insignia of the Order of Knight Commander of Saint Michael and Saint George, by Field Marshal Sir Douglas Haig, at London, England. September, 1919, received the Distinguished Service Medal, United States Army, for exceptionally meritorious and distinguished service. March, 1922, awarded the Italian decoration, Com. of Order of the Crown. Maj.-Gen. Squier is the amateur's friend.

The Tuning of Signals

After the detector and amplifiers are adjusted, the signals desired are "tuned in," by varying the inductance and the capacity of the receiving circuits. Where a separate primary and secondary circuit is employed, the beginner frequently makes the mistake of using too tight a degree of coupling, which increases the likelihood of interference from other stations. To pick up a signal, a moderate degree of coupling should be used, and the tuning of both primary and secondary heard; the coupling should now gradually be loosened, and at the same time the tuning of primary and secondary be slightly readjusted for

maximum strength. It will generally be found that, with a proper degree of loose coupling, interfering signals and strays may be diminished, without reduction in the strength of the signals to which the apparatus is tuned.

Where a single circuit tuner is employed, the tuning of the desired signals is greatly simplified, by the absence of coupling and secondary circuit adjustments. In one well-known make of single circuit tuner, both the inductance and the capacity of the tuning circuit are varied simultaneously, by means of a single adjustment; other makes of single-circuit

tuners are adjusted to the desired wave by varying the inductance by steps, by means of a tap switch, and then by careful variation of the tuning condenser.

The Washington Conference

There has been no official announcement from Washington of the rules and regulations applying to amateurs up to the time this issue of RADIO WORLD goes to press. The experts are still conferring with Herbert Hoover, Secretary of the Department of Commerce, at Washington. Readers of RADIO WORLD may be certain that they will find all the results of this important conference in these columns as soon as it is possible to give them authoritatively and in detail.

The Radio Primer

The A. B. C. of Radio For the Novice Who Wants His Facts Put Plainly and Tersely

Radio Definitions

AERIAL—Referring to a number of wires so arranged as to receive electrical waves.

ANTENNA—Same as above. Heinrich Hertz, discoverer of electric waves, used this term.

ALTERNATING CURRENT—A current which changes its flow periodically. Alternates.

ALTERNATOR—An electric generator for producing alternating current.

AMPERE—The unit of measurement of the strength of an electrical current.

AMPEREMETER—A device or instrument for measuring amperes.

AMPLIFIER—A vacuum tube which adds local energy to the incoming signal.

AUDIBILITY—The measurement of the strength of the incoming signal.

AUDION—An exhausted vacuum tube containing three elements namely: filament, grid and plate.

(See our next issue for definitions in B.)

Wave Length

The electrical frequency of oscillation producing the radio waves is generally defined in terms of wave length, i. e., the calculated length in space of each wave, expressed in meters. Wave length thus indicates electrical quality only, and in itself is no measure of the distance to which a signal can carry. It so happens, however, that very powerful transmitters are best adapted to operate on long wave lengths, while lower powered stations can employ the shorter wave lengths more effectively. Thus, for trans-atlantic and long distance communications by high-powered stations waves from 5,000 to 25,000 meters are generally used. Large spark stations with ranges up to 1,000 miles or more generally employ wave lengths from 1,500 to 3,000 meters. Commercial ship and shore traffic is assigned the fixed wave length of 600 meters. A wave length of 485 meters is reserved for weather and market reports by non-governmental stations, and all radio concerts are assigned the wave length of 360 me-

ters. General amateur stations are restricted to 200 meters or less. For special amateur traffic, and for work between experimental or technical training stations, other waves above 200, but below 600 meters, are granted by the government. It is seen that most of the signals of general interest are sent out on wave lengths below 600 meters, and can, therefore be copied efficiently on so-called short wave receiving sets. An exception is the nightly telegraphic broadcast from the government station at Washington, which includes time signals, weather reports, and press news, all on a 2,500 meter wave length.

As to Range

By "normal range" of radio telegraph or telephone transmitter is generally meant its dependable daylight range, under unfavorable conditions (local lightning storms excepted). Under favorable atmospheric conditions signals carry considerable further. At night, ranges of many times the normal daylight range are often attained.

Two Circuits Any Amateur Can Work

Fig. 1 shows an inductively coupled crystal receiver which shows L1, a primary winding and C1, a variable condenser. The antennae circuit may be tuned by means of the variable coil L1 and condenser C1. While the coupled or secondary circuit may be tuned to resonance with the primary or antenna circuit by means of the coil L2 and the condenser C2. This secondary circuit is shunted by the detector D in series with the telephone receiver T.

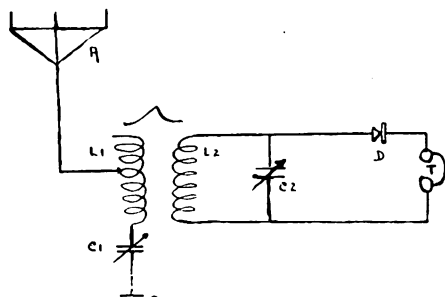
The coupling may, of course, be made as in Fig. 2, by means of a com-

mon coil. The primary and secondary circuits, considered independently, are seen to be the same as Fig. 1 not possessed by that of Fig. 2. There is the possibility of changing the relative positions of the coils L1 and L2 thus altering the coupling without changing the actual inductance of either circuit. Also, various combinations of capacitive and inductive couplings are, of course, possible, but are not shown here. The sound in the telephone receiver is frequently improved by shunting the couplings with a condenser "C3" of suitable capacitance as in Fig. 2.

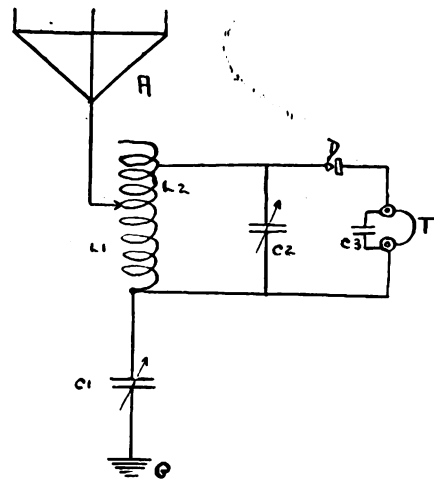
The operation is as follows:

Consider one half cycle of the high frequency rectified current. During the period of its duration the current flows through the detector "D" Fig. 2 and the telephone receiver winding T, and charges the condenser S; during the next half cycle of the oscillation, no current flows through the detector "D.", the condenser S, however, being short-circuited by the te-

lephone receiver, will discharge through the latter and the resulting current in the receiver will be in the same direction as the current of the impulse. There is thus, during each wave train, a more continuous attraction on the telephone receiver diaphragm, with resulting improved audibility. The use of a coupled tuned circuit in receiving signals will have a great effect on eliminating interference.



An inductively coupled receiver



A conductively coupled receiver

Radio Symbols at a Glance

Antenna .			Crystal De-tector
Battery.			Ground
Condenser.			inductance
Variable Condenser.			Variable Inductance
Connected Wires.			Variable Resistance
No Connection.			Fixed Resistance
Coupled Coils			Variometer
Variable Coils			Head Telephones.

What is radio? Here are the different symbols used in the circuits of today. If the amateur follows out these symbols he will be able to read and check up all circuits, so that he will understand them.

Transmitting Equipment

Complete radio transmitting sets are on the market, at various prices. A complete spark or continuous wave telegraph transmitter may be assembled by the experienced amateur at a cost of \$100 or more, depending on the range to be covered. Owing to its higher efficiency, freedom from noise, and its sharp wave, the continuous wave transmitter is gradually replacing the old spark type of transmitter.

Methods of Signalling

There are several methods of radio signalling in use at the present time: Damped wave telegraphy (Spark), radio telephony (Phone) modulated or interrupted continuous wave telegraphy (MCW or ICW), and continuous wave telegraphy (CW). All but the last one of these methods may be received with any kind of crystal or vacuum tube detector. The reception of continuous wave telegraph signals, however, is accomplished with an oscillating vacuum tube circuit, and is generally not practicable with a crystal detector.

"Fading" of Signals

At nighttime it sometimes occurs that signals from distant stations "swing" badly, or vary in intensity from one moment to the next. They may gradually become weaker, and even fade out entirely, and then reappear with varying intensity. This phenomenon is known as "fading" or "swinging" of signals, and is believed to be due to certain conditions of the atmosphere. Stations within reliable daylight range are seldom or never observed to fade appreciable. If signals from various stations heard appear to fade or swing simultaneously, the receiving set should be suspected; in this case the cause is frequently an exhausted filament or plate battery. The condition of the "A" (filament) battery is indicated by the filament brilliancy attainable or with a storage battery hydrometer, while the "B" (plate) battery units are tested by means of a voltmeter, and should be replaced if the voltage per unit does not come within one volt of the normal value. An irregular hissing or frying noise is frequently another indication of an exhausted "B" battery. Watch for it.

Telegraph Signals

Of general interest are the accurate time signals sent out twice daily by the high powered station at Washington, D. C. (Arlington), as well as by the station at Great Lakes, Ill., and by other naval stations. For those able to read them, the messages in the continental telegraph code will always retain their fascination. Press news, weather and market reports, commercial, ship and shore traffic, and various amateur messages are some of the telegraphic signals which may be overheard anywhere. While most telegraphic messages are sent at a fast rate of speed and are not intelligible to the novice, certain signals are sent more slowly, and thus afford good practice to the beginner, or one who is not a thorough expert.

With equipment especially designed for the reception of long-wave signals from several European as well as Pacific stations are quite commonly overheard almost anywhere in the United States. With the exception of a few high-priced sets, the tuning coil for long waves will also efficiently receive the ordinary short-wave radio-telephone signals.

A 500-Mile Radio Phone Employing a 5-Watt Tube

By Frank A. Hahnel---Station 2BUA.

I have had many inquiries from different amateurs who have heard me transmit voice on phone, requesting details regarding my set, and from others who ask "How do you do it on one 5 watt tube?—I am sure, therefore, this would be interesting to amateurs, everywhere, who contemplate installing a C. W. or phone set.

Having experimented for many months in the transmitting of voice I found that I could radiate .7 ampere on a single 5 watt tube, which was very neat looking, but I could reach only 50 miles. This was not satisfactory to me, so I reconstructed the set, using another circuit. This was very satisfactory, although I could radiate only .1-amp. more than the first circuit, but it carried much further, using the following hook up:

With the above diagram, I received perfect modulation and reached a distance of 500-miles on voice. During my conversation with station 3ZY, located at Washington, D. C., I was heard by station 3CZ—at Toronto, Canada, and reported as follows: "Jan. 5, 1922—Voice copied at 1:30 A. M. Heard your 5 watt tube, when working station 3ZY. Some stunt for radiation of .8 amp. The party receiving this was using a short wave regenerative set, and 2-stage amplifier."

Other stations, such as 3ZY report, as QSA. "Almost fell off the chair when you stated you were using one 5 watt tube radiating .8 amp. Heard every word you said clearly and distinctly."

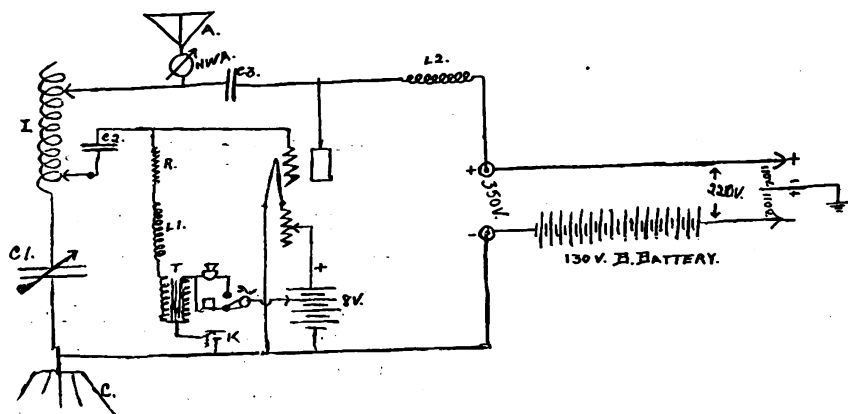
Other stations I have worked by voice are reported very QSA. were

stations 1AJP-Bridgeport, Conn. 1QN-New Haven-3HJ-Richmond, Va. Canadian 3CZ-& 3 ZY-Washington.

You will note on circuit shown that I am using 220v. D.C. of the house current and 130 volts "B" Battery. This gives me 350v. D.C. for the plate. Those having direct current can use this by connecting to the two outside wires of a 3-wire main fuse block and then connecting the 130 volt "B" Battery in series. Iron core chokes are not used in this circuit, as perfect modulation is assured without them. Those having A.C. current can use a motor generator set or a transformer and rectify it, but then iron core chokes will be necessary.

As a modulator transformer I am using a $\frac{1}{2}$ " spark coil, as this gives better modulation, with the circuit shown. Inductance I is wound with 40 turns of No. 16 gage copper wire, on a $4\frac{1}{2}$ " Bakelite tube, tapped every 2 turns. Aerial is of 4 wires 35 ft. long, with a 70 foot lead-in. Counterpoise is of 1-wire, 200 ft. long, and at the farthest end is about 35 ft. higher than the aerial proper.

When trying out this hookup, do not get discouraged at first results, but be positive that condensers are of right capacity, aircore chokes of right resistance, and set properly tuned, as one tap on inductance will make considerable difference, as the set will not oscillate. With my set, made according to diagram, you will soon have an answer to the query. "How can you do it on a 5 watt tube?"



C1-Variable condenser. C2-Fixed condenser .0005 MFD. C3 Fixed Condenser .005 MFD. R-Grid resistance 2500 ohms. L1-Air core choke 100 turns No. 28 D. C. C. L2-Same as L1. T-Modulation transformer or half inch spark coil. I-Aerial inductance 40 turns No. 16 copper. H. W. A.-Hot Wire ammeter 0-1 amp. C-Counterpoise. K-Key.

Radio and the Country Clubs

Radio World March 20, 1922
1493 Broadway,
New York City,
Gentlemen:

Q. Several members of our Club are very much interested in radio. Will you please advise us as to the advantages a Country Club would derive from installing a good radio outfit, its approximate cost, just what equipment is necessary, and any other advice or suggestions you think will be helpful?

Yours truly,

F. C. Wilcox,

Chairman House Committee

There are many Country Clubs, that already have radiophone receivers.

Their members derive much enjoyment from listening to the various broadcasting stations of the country. News, market reports and various other items, are being broadcasted every evening, besides the fine talent of vaudeville entertainers. There are several different types of receivers on the market today. We would advise you to have your set installed by one of your members if some technical knowledge or some well-known concern. One important point to make clear to you is be sure you purchase a regenerative receiver having its wave lengths variable from 200 to 2500 meters. A two-step amplifier with a loud speaker is recommended as the signal strength will be in volume and rendered from a

large horn, instead of the troublesome head set.

Prices range from \$15 to \$300. It must be remembered that results will usually be in direct proportion, to the amount spent on the set, and an old rule applies to the radio game, as well as to any other—you cannot get something for nothing, in radio or anything else.

Answers to Correspondents

The Editors of RADIO WORLD will be glad to answer inquiries from readers. In sending a letter of inquiry, be sure to add your name and address legibly. Write on one side of sheet only. Address letters to Inquiry Editor, RADIO WORLD, 1493 Broadway, New York City.

Radio As Aid To World Commerce

By A. G. Cruikshank

Edward J. Nally, known as head of the Radio Corporation of America, and one of the greatest authorities on radio communication, gives voice to very interesting and valuable ideas regarding the future of this science. Too many still regard radio telephony as a plaything to be classed with the phonograph. Those who are familiar with its possibilities know how much more is to be done to introduce a new era of communication between the furthestmost points on the world's surface. Mr. Nally's opinions are from a viewpoint not often presented to the public at large. His purpose is to show the newly developed science as an auxiliary to commerce rather than to stress the more familiar keynote of the "wonders of wireless," which have been the subject of many articles in the press.

The single fact that radio communication is the one medium capable of placing isolated communities in instant touch with the centres of civilization has a boundless appeal to the imagination. That, too, it has forever ended the vast silences of the sea further adds to its romances.

However, until it becomes a general household utility, it will probably remain in the public mind as something very mysterious.

The underlying reason for the rapid strides it has made is not because of its romantic, intangible or mysterious nature. Its important position in the field of communication is due solely to its utility, and its combination with the three essentials of accuracy, speed and economy.

In addition to providing mariners with weather reports, storm signals and warnings of possible dangers to navigation, it enables passengers at sea to keep in touch with world affairs and with the movements of commerce and industry. Daily news bulletins are published on practically all of the ocean going vessels and transactions of great magnitude and of momentous importance are being carried on constantly between ship and shore through the medium of radio communications.

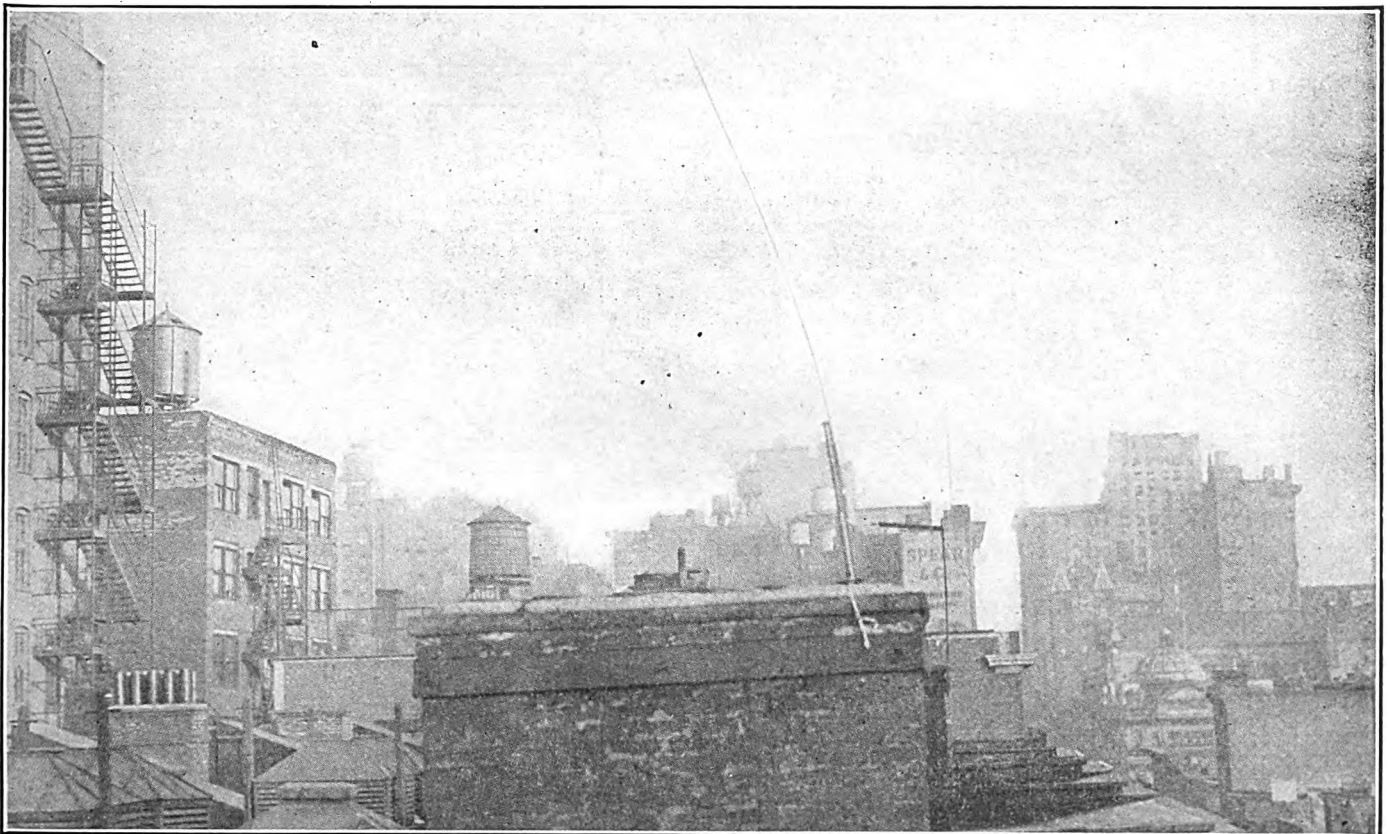
In its international application, radio is today carrying overseas a very material percentage of the world's communications. Radiograms, commercial and social, aggregating mil-

lions of words annually, are being sent daily across the Atlantic and Pacific oceans.

Another great advantage possessed by radio is what might be termed its universality, with reference to communication with several distant points at the same time. This was illustrated on the occasion of the formal opening of radio central, a super-powered station of the Radio Corporation of America, located at a point on Long Island about sixty-five miles distant from New York City. President Harding threw a switch in the White House, and a message which he prepared for broadcasting to the world ran through a mechanical transmitter and the words, carried by land wire to radio central, were flung into space without the intervening agency of a human hand.

The first answer came back instantly. Others followed close upon it. Acknowledgments were received from such widely scattered points as Norway, Germany, France, Italy, England, Belgium, Sweden, Hawaii, Canada, Cuba, Japan, New Zealand, Panama, Colombia, Costa Rica, Nicaragua, Honduras and Australia.

A Simple and Practical Aerial



View of a practical aerial installed by a New York City amateur on the roof and which any amateur can work.
(c. Keystone View Co.)

"Tell Me, Please, How Far Will This Set Receive?"

A Story of the Little Things That Add Mileage to Receiving Sets

By E. L. Bragdon

THE other day a radio enthusiast down in a remote part of Texas reported hearing code messages from the far-off German station at Nauen, known to long distance listeners by its call letters POZ. The stunt itself is not so much. Many amateurs are doing the same thing almost daily. The portion of the Texan report that lifted an eyebrow here, and brought forth an ejaculation of wonder there, stated that in picking up the foreign station a simple galena crystal detector was used.

Contrast with this feat the discouraging efforts of fourteen-year-old

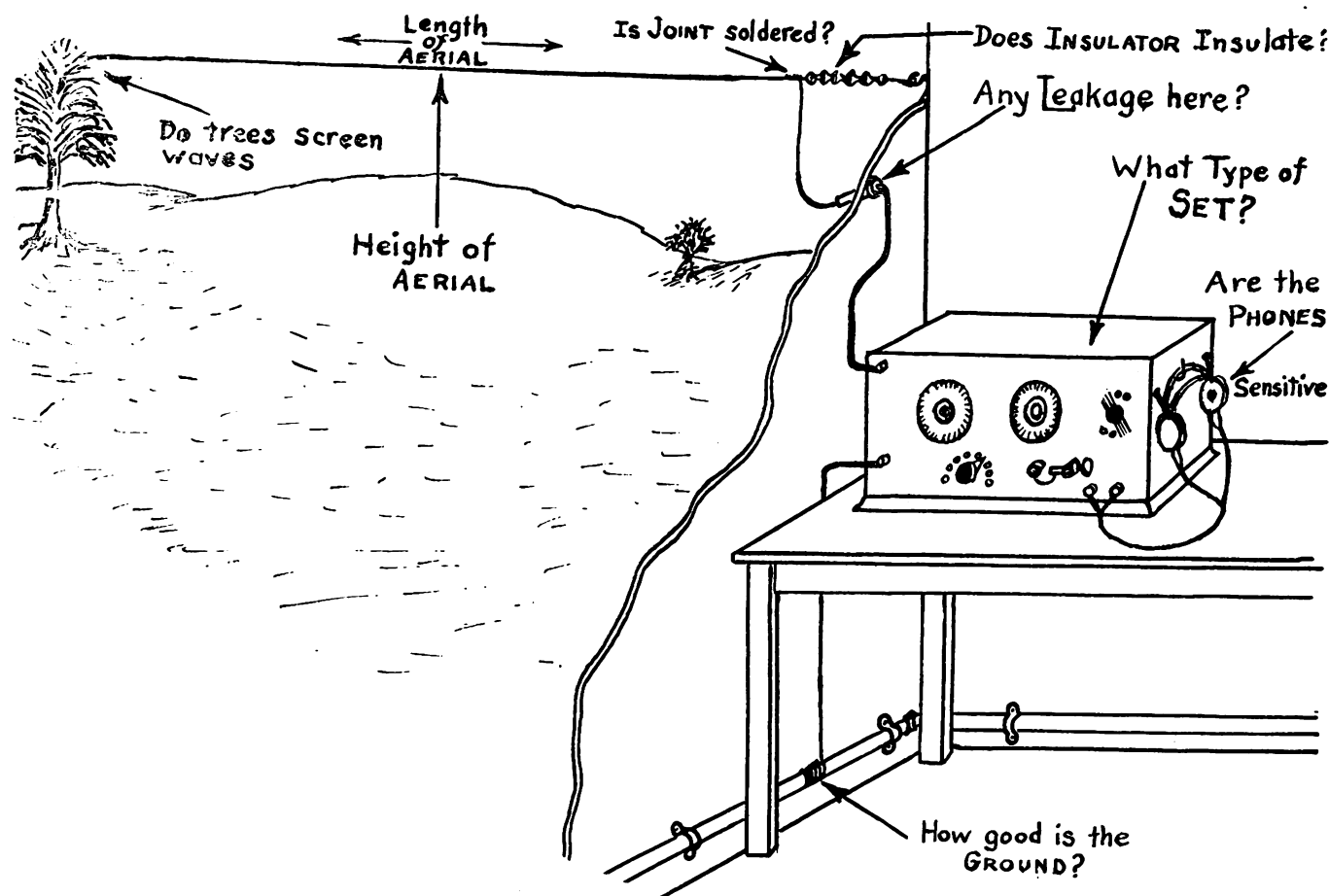
As far as I know the subject has never been scientifically investigated, but it is a pretty safe guess that no salesman sells a wireless receiving outfit without being asked that fundamental question, "How far can I hear with this set?" The salesman knows somebody who knows somebody whose friend has one of the outfits and this friend has heard a concert 87 miles with it. So he answers, maybe, "Oh, you ought to hear 75 to 100 miles." That is where all the trouble starts.

The purchaser takes the set home, puts up his aerial according to in-

dead to them. But—the salesman said the set would receive up to 100 miles and the purchaser is only 20 from WJZ. What's the trouble?

So much for introduction; now to plain talk. Neither transmitting station nor receiving station has any such thing as RANGE. The range can no more be figured than the age of Ann or the length of a section of string. That is the first point on which most of us trip.

Just how far a radio telephone transmitting station can make its program carry, depends on the power used, the kind of night, the time of



A Typical Receiving Station Layout with Arrows Pointing to Parts that Influence the Receiving Range. Few Stations Can Pass This Test with 100%

Charlie in the Bronx of New York City who has been trying in vain to hear those wonderful concerts from nearby Newark, only twelve miles away. Charlie, too, has been using a galena detector. Why, then, does one receiving set have a range a thousand times greater than the other. With all the world, his wife and their children seemingly interested in radio, it is about time that this problem was brought out into the open and examined, analyzed and settled.

structions on page three, last paragraph, hooks the lead-in wire to the post marked "aerial," the ground wire from the post marked "ground" to the radiator, snaps on his head phones and listens. Too frequently he listens, listens and listens. He hears a beautiful buzz but there's no signal to it; it's continuous. He hears, also, the contactors break on a nearby elevator panel and they do sound like signals, but as for the concerts, music, speeches, the air is totally

year, the skill of the transmitting engineer and lastly, but most important of all, on the quality of the receiving station. Which brings us to the heart of our trouble.

A receiving set consists of that lonesome wire on the roof, a secondary wire connecting the aerial with the receiving set, the layout of instruments, the ground connection and the human being with the phones. Five factors in all and each one as important as all the others lumped.

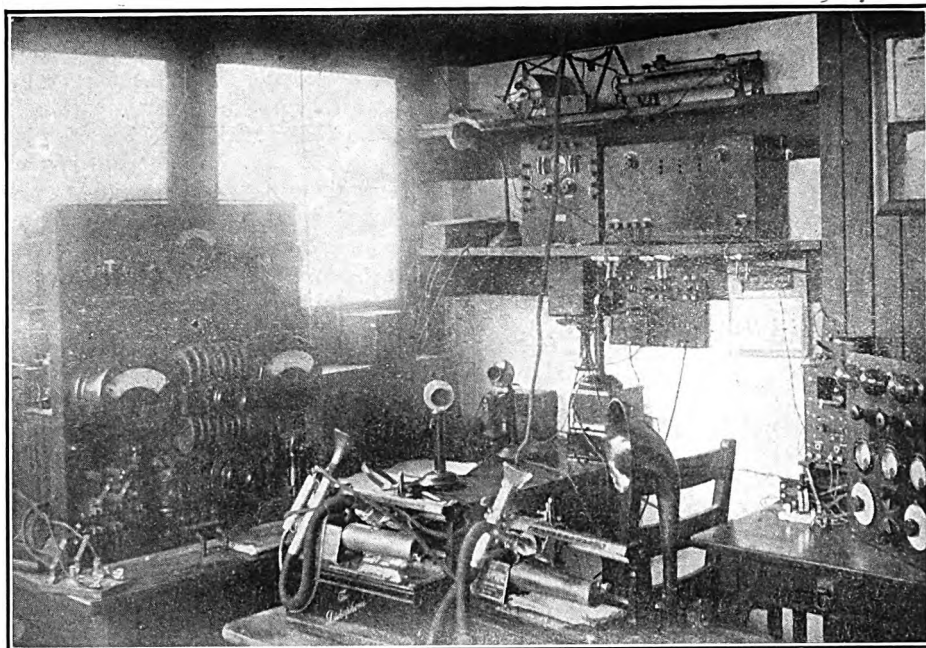
Medical Service By Radio

The Radio Corporation of America announces that, in co-operation with the Seamen's Church Institute of New York, and the United States Public Health Service, free medical advice to ships at sea is now available.

The Federal health authorities had entered into negotiation for the purpose of placing the service on a national basis, with the result that the Radio Corporation of America, with its great layout of coastal stations, agreed to handle this medical service for all vessels.

Vessels desiring medical advice can secure prompt service by addressing radiograms to the following stations: Chatham, Mass. (WCC.) Siasconset, Mass. (WSC.) New York City, N. Y. (WNY.) and Cape May, N. J. (WCY.).

The medical advice given by the stations mentioned should be phrased in language (English) intelligible to a layman.



Radio Medical Station of Seamen's Church Institute, 25 South St., New York City, showing loud speaker on right, with dictaphones to record the message.

(Continued from preceding page)

If four out of five are in perfect working order, with the fifth lagging behind, the set is at 50 per cent or less of its efficiency. The whole is no better than its worst fifth.

Perhaps the best way to become convinced of the need for thorough perfection in receiving sets is to take the factors in order and point out the possible weak spots, just as a health examiner probes and punches and reports, so that you may keep an eagle eye on the most tricky places.

First the aerial: the wire should be as high as it is possible to make it. If height cannot be obtained, then the length must be made greater. With both height and length curtailed the effective range of the set is materially lessened.

The aerial must be lifted above all trees, particularly those near it. Branches are parasites of wave energy. If the aerial is over a roof the clearance should be ten feet or more, otherwise the effect of the roof surface will be the same as if it were the ground surface and the antenna only a few feet above it.

After the aerial comes the leading-in-wire. If this is soldered to the aerial some of the already depleted energy of the wave will be used up in changing from one wire to the other unless the joint is soldered and made electrically perfect. And the making of a good joint is an art. Then, following down the "lead-in" through the wall by means of an in-

efficient insulator we come to the receiving apparatus.

How far, now, will the set receive? Well, we have already noticed a half dozen points where the energy may be lost before it ever reaches the set to be detected. So that, right up to the first binding post of the tuning coil, there have been opportunities for the wavelets to depart before meeting the set with "the hundred mile range." And not one of the faults can be laid at the door of the apparatus. Which provides us with the first chance to ask this other question "How can a set *have* a range when the waves are not allowed to reach it to *give* it a range?"

There is nothing gained by detailing the other weak spots in the receiving station. Each one of them is a potential wrecker of ranges. There is the poor crystal with few sensitive molecules; there is the poor ground connection on the radiator pipe; there are the cheap and often unsatisfactory head phones; and there is the so-called operator.

After considering all these points it is possible, even if not permissible to make a formula for the receiving range of any set, as follows:

The receiving range of a receiving set is equal to

the Power of the Transmitting Station plus the design quality of the receiving set minus the poor aerial, poor ground, poor adjustment and plus or minus the operator.

Translated, this equation reduces

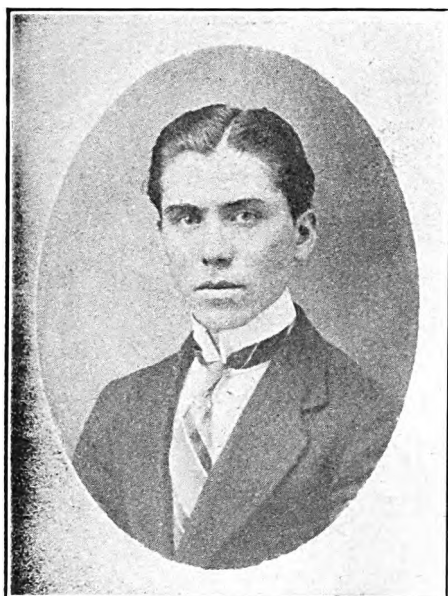
to the fact that there is no such thing as a receiving range. The one and only way to determine the type of set needed at a certain point is to locate another amateur and study his conditions. If they are similar to those in mind, a similar set can be used. But if conditions are different, resort must be had to the old reliable "cut-and-try-again" method.

The man who has plenty of money to pay for a set need not be bothered by these limiting factors. He can afford to install a set with reserve power; but the amateur who wishes to purchase the lowest priced outfit consistent with results to be obtained must consider them seriously and set off, one against the other, the advantages and disadvantages of his location and the excellence of the various parts of the installation.

That receiving set in Texas that eaves-dropped on POZ might be a total fizzle if transported to New York City, while little Charlie's disappointing outfit in the Bronx might well startle the world if set up in Texas.

Probably the only real, dependable range of a receiving set is the wide range of its possibilities, and no one can tell how good or how bad they will be until the set has been actually tried out under conditions exactly similar in every respect to those where the purchaser lives.

Radio Championship Won By Chilean



Jose M. Seron, of the Radio Corporation of America

A new world's record of 49½ words a minute for the reception of the Continental code by wireless has been made by Jose M. Seron, of the Radio Corporation of America. B. G. Suetter, wireless operator of the New York "Times" radio station, who held the former record for two years, finished second.

Seron, with three errors in his copy, was a slight margin ahead of Suetter, who received the same number of words a minute but with four errors. George Otten, of the Radio Corporation of America, had five errors. Three other men in the final of the contest were Bernstein, of the Eastern Radio Co., C. C. Henderson, of the Radio Corporation, and J. G. Smythe of the Western Union.

Seron will receive a cup as the winner while Suetter will receive a gold medal, and Otten a silver medal.

The Faces of Amateurs

RADIO WORLD will be glad to receive pictures of radio amateurs for an important group of portraits now in preparation.

Send your portraits, with name and address written on back, (cabinet size, preferably, whether taken in a studio or posed with instrument) to Editor, RADIO WORLD, 1493 B'way, New York City.

Run On Radio Books

The public libraries are experiencing a run on their books referring to radio telephony. Numbers of libraries have a long waiting list averaging ten to fifteen names for each book.

Do Not Fear Intelligent Regulation

By Emerson Gaige

Some years ago there was a great deal of apprehension on the part of a few pioneer automobile owners when the various government bodies decided that regulation of motor cars was a necessity. A hue and cry was raised that it would mean the retarding of the development of automobile transportation.

It is evident today that this fear was not well founded. It can hardly be said that the development of automobiles has been retarded by government regulation.

The same holds true in wireless. Intelligent regulation on the part of the government will, in all probability, do more for the advancement of

wireless telephony than any other step that can be taken. If it comes to a point where thousands of amateurs are sending forth into the ether any kind of sounds or messages on any wave length, there would be little opportunity for those inclined to experiment for the betterment of the industry, to attain success.

The United States Government well realizes that a great deal of the credit for the wonderful advances in radio has been due to the fact that any man, woman or child in any city or hamlet has been able to experiment in wireless telegraphy to their heart's content. The acknowledgment of this fact has been made by France in only recently removing the restrictions on amateur radio operations in that country. "Freedom of the Air" is necessary for radio development.

It is not to be expected that the United States will place restrictions upon the amateurs that will prohibit their experimenting and operating along lines that will leave plenty of room for improvement and development. The radio amateurs should cooperate with the government in whatever manner possible.

She's An Expert



Miss Mary Moley, of New York City, has become an expert operator. She is shown here taking down weather reports over her phone (c. by Keystone View Co.)

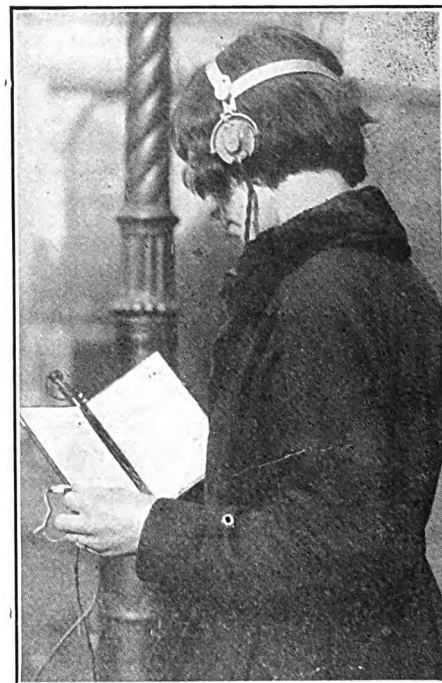
A Wireless Kiss

From Mid-Atlantic

A kiss, wave-length unknown, traveled from some five hundred miles out on the Atlantic Ocean to a young woman in Brooklyn, N. Y., recently. Its twin, eluding all the frontier guards, traveled back over the Atlantic ocean to the steamship "America" straight to the man it belonged to.

There is nothing scientifically new in sending a kiss by wireless, for anyone who can send a kiss over the ordinary telephone can send it through the ether. However, it remained for Hugo Estburg, chief radio operator of the "America," and Miss Ranghilde Anderson, of 629 Vanderbilt Avenue, Brooklyn, to actually accomplish the deed. The "America" sailed on a Saturday for Bremen and on Monday, Chief Estburg called up Miss Anderson via wireless. At the close of their conversation the wireless kisses were exchanged.

Over in London



A handy little pocket wireless, the shape and size of a pocketbook. The small aerial can be slung over a lamp post. Photo shows a girl regulating her watch from the Paris time signals which she is receiving. (c. Keystone View Co.)

Radio World's Notice To Daily Papers

In order to increase the interest in the radio field, the publisher of Radio World hereby grants full permission to daily and other papers to reprint the material in this issue, without restriction as to length, except when contents bear a special copyright line, but with the request that the usual courtesy of reprint credit be given this publication and the writers, whose names appear over articles.

One of the most remarkable evidences of the way the radio field has attracted and held the attention of the millions, is shown by the daily newspapers. Every newspaper in the country is, of course, devoting some space to radio matter because it figures in the day's news, but many of them have gone still further by starting regular radio departments. All this is grist to the mill. The more space and attention the American press gives to radio, the greater will become public interest and the more far-reaching will be the results.

Radio has been likened to the motion picture in the matter of quick

growth—except, of course, that radio, in its latest broadcasting developments has forged ahead faster than the motion picture ever did during any period of its growth. Years of motion picture activity and progress were required before the daily papers paid much attention to it, and in fact, it is only within recent years that papers like the New York "Times," The Chicago "Tribune," and others in their class deigned to carry a motion picture heading over their reviews or news notes.

In order to help along the radio proposition and to aid everybody connected with it in any capacity

whatsoever, RADIO WORLD announces here that radio editors everywhere may use material from its columns. It can be readily seen that a paragraph or an article in RADIO WORLD that reaches the eyes of, let us say, 100,000 to 200,000 people, thru this paper (as more than one person sees each copy) would eventually be seen by a total of millions, according to the number of papers that use this material thruout the country.

We consider this a matter of so much importance that this permission is hereby granted until further notice, except as noted in the foregoing.

Hints On Purchasing Good Receivers

After the beginner has surveyed the radio field, he may be so mixed up and dizzy that his mind is not fixed upon any specified type of receiver.

There are two receiving sets on the market at present, and they are commonly known as the crystal set, and the set that employs a vacuum tube or audion. Both of these receivers will receive both spark and telephone messages. Still, there are none that will simply just receive telephone. However, with the better class of receivers made today, tuning is so sharp that the undesired spark stations can be easily eliminated.

The present market has quite a number of different types of crystal receivers, which are simple for the beginner to adjust, but remember, these sets will only bring the music in for short distances, as the receiver is what is termed Non-Regenerative.

At the present time there are many beginners complaining about interference from other stations and most of this can be laid to the crystal receivers, as they do not tune sharply. Remember that interference is our great difficulty of today, as there is no such thing as having the air clear entirely for broadcasting purposes.

The regenerative set is far superior to the other type just mentioned and will bring in the signals much louder, but the great advantage of this type of receiver is that, with the aid of a step or two of amplification,

we can tune our circuits to such a degree of efficiency that we can eliminate most of the stations undesired. A loud speaker can be easily used on this type of receiver.

When purchasing a receiver of this type (regenerative) be sure and ask the salesman for a set that tunes from 200 meters to at least 2000 meters or above — the higher the better — as some broadcasting stations are work-

ing on much higher wave lengths than others. It is wise to get a receiver that will work on the wave lengths mentioned. Any particular set cannot be recommended as there are good ones and bad ones, cheap and expensive ones, but the old saying applies to radiophone receivers just as well as any other—you cannot get something for nothing. Think before you buy.

Fire Fighters at the Wireless



How firemen of No. 9 truck of Jersey City spend their leisure time.
(c. Keystone View Co.)

Short Cuts In Receiver Circuit Design

By O. C. ROOS (Fellow I. R. E.)

The Engineering Dept. of RADIO WORLD is designed to reach the earnest student who is not afraid of simple tables, curves or even a bit of algebra. There are certain facts that can not be mastered by cut-and-dried methods. Many a budding experimenter has never successfully run the gauntlet of hard facts and figures leading to the haven of the professional designer.

A discouraged experimenter will never "bone" to become a designer. There are approximately 50,000 enthusiasts capable of analyzing a simple receiving circuit. Hence the following series of articles.

Have you ever figured out a set of wavelengths for a new combination of coils and condensers—only to have it "way off" the expected range? I should say that 75 per cent of the sets designed by the beginners themselves would justify this experiment being called a failure.

To design a set to range from 250 to 3,000 meters and to find that its actual range is from 300 to 3,200 meters causes a shock.

The shock has occurred so frequently to most students of radio design that they have become hardened to it and make allowances for the exceptional lengthening of the smallest wavelength and the reduction of the instrumental range as shown above. In this case it was calculated to be a 1 to 12 instrumental range in wavelength, but alas, it turned out with an actual range of 1 to 10. In other words, the expected range has been cut down 17 per cent by some ever-present cause.

Well, what can we do about it? The answer is simple: stop and examine the elements which are essential to a tuned circuit and then look around for unexpected opportunities given them to act, which have not been considered in calculating the range of the instrument.

To go to the root of the matter at once, it may be stated that the condenser effect of the wiring in the instruments for radio work is at the root of 95 per cent of this kind of trouble, in spite of the fact that the wiring adds an inductance or coil effect to that already given by the coils. This inductance effect of the leads is, however, small compared to the above condenser effect of the leads. It does not in itself appreciably change the actual behavior of the set from that calculated for it.

Let us glance over the elements which go to make up an instrument passing from, say, 200 meters to 24,300 meters in four coils or with three "taps" on the same coil and with a condenser whose maximum capacity is 20.25 times its zero or minimum capacity. We will omit the question of efficiency or damping for the present.

Suppose we ask:

Firstly—How many elements must we select in this problem, so that, knowing them, we shall be able to design *accurately* any set with a variable condenser and a set of coils or else a set of changes in inductance? The answer is, there are five elements and no more. Knowing any three we can determine the other two at once.

To obtain the first, experimentally proceed as follows: Keep the inductance of the radio circuit constant and vary the condenser. The smallest wavelength in the 200-24300 meter set will go about 4.5 times (we find) into the largest wavelength. This ratio is very important and is called the condenser wavelength ratio. It is denoted by the letter "g." If it is squared it equals the condenser capacitance ratio 20.25; since the wavelength increases as the square root of the capacitance, and is denoted by the letter Rc. Capacitance is the standard word used among radio engineers for denoting the ability of a condenser to store electrical energy. Its popular forms is "capacity," but you might as well start right.

To obtain the second element, we proceed in the opposite way, by keeping some particular condenser setting fixed throughout the experiment and by changing the coils or "taps" on the inductances. If the instrument is to be well designed we shall have to make each step a certain constant ratio with the previous one as a standard—this saves wire.

Hence with four coils or three coil changes we get $3 \times 3 \times 3$ or 27 times the wavelength obtained with the first coil. This ratio for the coil-change is called the coil-change wavelength ratio and is very important. It is always less than "g," the condenser wave length ratio and is denoted by the letter "h."

Applying "g"=4.5 and "h"=3 to the above wave meter we start at 200 meters and apply g *once* this gives a maximum of 900 meters with the first coil. Applying h three times we get 24300 meters, which is what the instrument should reach.

If we had cared to examine a sim-

ilar receiver ranging from 200 to 8100 meters we could have used three coils instead of four. Then, starting with condenser plates all in to give 900 meters we would have two instead of three, so that 900 multiplied by $h=3=9$ gives 8100 meters, which checks. We are still ignoring the wiring, remember.

The third element is obvious, as it is the number of inductances used and is denoted by the letter N. The number of inductance-changes are, of course, one less than this or N-1. In the above examination of a 200-24300 set N-1 therefore has a value of three.

The fourth element is found experimentally by dividing the longest possible wave by the shortest, or in the above case we have the quotient of $24300 = 121.5$. This is called the total wavelength ratio and is denoted by the letter RA. It tells the actual range in terms of the shortest wavelength *whatever that is*.

The fifth and last element is called the "overlap" and tells how much of the condenser range is used *twice* in passing from one inductance to another. Some overlap is necessary to avoid a "break" in the wavelengths receivable by the instrument. It is no use to have an instrument read from 200 to 900 meters by varying the condenser and then, when a new coil was put in, to start a second range exactly at 900 meters. There would be no "overlap" for tuning at 890 meters with the first coil in! as it would be too near the end of the scale.

The actual "overlap" between Range 1 and 2 in meters is the difference between 900 meters, the maximum of Range 1 and 600 meters, the minimum of Range 2. This value, 300 meters, is divided by Range 1, which is 900 meters, minus 200 meters, or 700 meters. The percentage overlap divided by "v" is thus $300/700$, or about 43 per cent a good value. It will be found that Range 4 and Range 3 have this identical overlap, as well as the other ranges.

We may now write down two expressions which connect all five of the above elements for radio design:

$$Rt = gh - N - 1 \dots\dots\dots (1)$$

(The total range) equals (the condenser wavelengths ratio) multiplied by the coil-change wavelength ratio taken as many turns as there are inductance changes.

$$v = (g-h) \div (g-1) \dots\dots\dots (2)$$

(The overlap equals the difference between the condenser and inductance change ratios divided by the condenser ratio minus unity. In this case $v = (4.5-3) \div (4.5-1)$ or $1.5 \div 3.5 = 43\%$.)

We have already seen that $Rt = 4.5 \times 3 = 121.5$.

Making A Short Wave Regenerator

By Fred. Chas. Ehlert

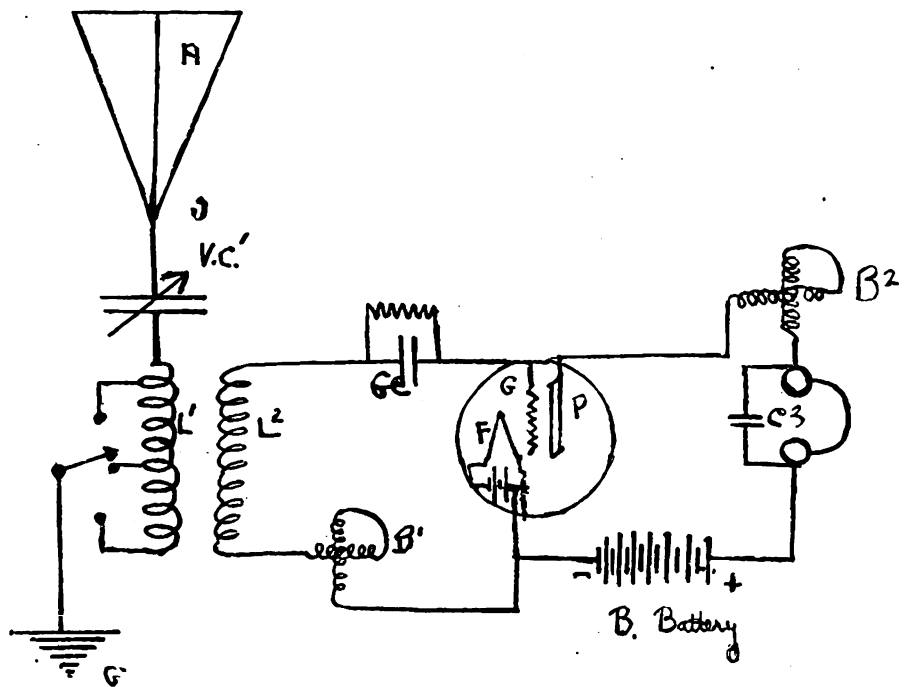
Many radio amateurs experience difficulty in the operation and construction, or assembling of the continuous regenerative type of receiver which is at the present time so popular.

There are many ways by which troubles can be divided: namely, inability to tune to a given wave length, or difficulty in controlling the regeneration effects, an important factor in this type of receiver.

The former trouble is due to an improperly designed circuit and the latter trouble to the plate circuit failing to regenerate. However, this may be laid to improper connections or incorrect plate voltage. This trouble can be overcome by testing out your circuit or by a little experimenting. Tubes sometime give you trouble, as they all have different characteristics which require specific amounts of current for successful operation.

This diagram shows you a regenerative circuit using two variometers and a variocoupler, and if they can be purchased at any radio shop you can start building your own set.

The assembly is as follows: One .001 Variable Condenser (VC1.) Variocoupler as (L1 and L2 in diagram,) two variometers as B1 and B2, Grid Condenser and leak as GC, "B" Battery, Telephones, Tube and socket, A-Battery of six volts to light filament. Rheostat to control filament, and a condenser as C2.



Efficient circuit employing two Variometers—See accompanying description.

This set when wired up as per diagram will operate on amateur wave lengths and if properly adjusted will give absolute satisfaction. The grid variometer tends to tune the input or secondary circuit, while the plate variometer controls the amplification on regeneration by tuning the output on plate circuit in resonance with the

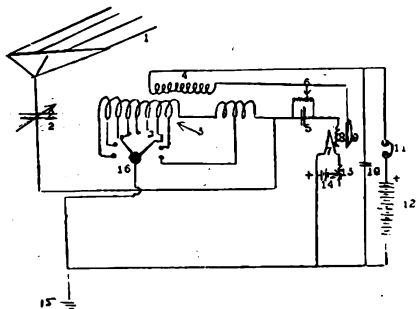
input circuit, thus causing it to oscillate direct, feed-back being avoided in this receiver.

The condenser is a great help in controlling the plate circuit for fine adjustment and acts as a by-pass for high frequency currents. Of course, in picking up stations, tight coupling should be used.

A Simple Regenerative Receiver

This regenerative receiving set employing a tickler coil can be easily constructed by the average amateur.

The primary inductance winding in the aerial circuit should consist of about 160 turns with taps every 15th turn. The capacity of the variable condenser should be of .001 m. f. and the phone condenser of .0005 m. f. The tickler coil, which is in series



Simple circuit with tickler coil.

with the plate circuit, should rotate one half a turn inside, and at one end of the main inductance and should consist of a wooden rotor wound with 60 turns of No. 28 wire. This circuit will receive wave lengths up to about 1000 meters.

1. Aerial or Antennae.
2. Variable condenser.
3. Primary inductance.
4. Tickler coil.
5. Grid condenser.
6. Grid leak.
7. Filament of Vacuum Tube.
8. Grid of Vacuum Tube.
9. Plate of Vacuum Tube.
10. By-pass condenser.
11. Telephones.
12. "B" Battery, 22 to 45 Volts.
13. Variable Rheostat.
14. "A" Battery, 6 Volts.
15. Ground.
16. Switch for changing wave length.

Earth May Conduct Radio

Dr. Steinmetz, Chief Consulting Engineer for the General Electric Co., states that under certain conditions radio waves might travel through the ground or the sea easier than through the air.

He considers well founded the supposition that recent performances of low power radio sending apparatus, in transmitting messages to surprising distances, give an indication that the radiations peculiar to wireless transmission passed through the earth as easily as through the air. Such radiations, he said, would accord with accepted electrical laws, as the ground, to which both the sending antennae and receiver set are connected, would act as a return circuit for the current. In like manner, Dr. Steinmetz pointed out that water might serve as a medium for radio conversations between ships, or between ships and land.

Second Annual Radio Show

Of the
Second
Coun

THE closing of the Second Annual Radio Convention within the glass-inclosed roof garden at the Hotel Pennsylvania, in New York City, marked the ending of the biggest thing of its kind in radio history.

The success of the show which ran March 7 to 11, inclusive, is the more remarkable when it is to be considered that it was arranged for the amateur and dealer, and not for the general public. Casual visitors were amazed to see the vast crowds of people who came to witness the latest developments in this art and science. Despite the thousands that filled the halls, the exhibition was carried out with skill and precision. The next convention will undoubtedly be held in one of the larger exhibition halls or armories in New York City.

So dense was the crowd at times that the police and fire departments took a hand regulating the crowd. At various times, policemen on duty called a halt and no one was permitted to enter until others had left. When the crowds had been thinned out a little, eager fans were allowed to enter in batches, while others went home to return some other evening. It is a notable fact that in the first

two days of this year's show more people were turned away than visited last year's show during the whole week.

Among those on hand was J. O. Smith, chairman of the Executive Radio Council of the Second District, and owner and operator of the station 2ZL. Paul Godley, "long distance demon," demonstrated his long distance receiver, while Alexander Lolass and his Chief Electrician, E. W. Dannals (DA) of the American Electro-Technical Appliance Co., claimed the largest assortment of radio apparatus.

There were many features, along the lines of efficient receivers, telephone and spark transmitters, besides what was displayed by the manufacturers of accessories. One of the most remarkable pieces of apparatus displayed at the convention was the Lyradion concert grand, which was built to fill a concert hall with radiophone music. It convinced those who saw it that radio is not a fad. The volume that came forth was amazing.

The show concluded with an annual dinner of the amateurs, at which some 1,100 guests sat down. Among the speakers were Prof. Alfred N.

Goldsmith, David N. Sarnoff, of the Radio Corporation of America, and Lieut.-Commander D. C. Patterson. Other guests were skilled technical men and expert operators in governmental and business positions in New York City many of them travelling thousands of miles to lend their presence at the exhibition.

It is curious to note that the visitors at this year's Show did not represent any particular element of the general public. Men, women and youngsters representing every stratum of society were on hand to prove how general is the interest in everything pertaining to radio. All were animated by the same desire to learn as well as to see and to hear.

A speech made by Paul F. Godfrey, the man who put up the station in Scotland last year for the purpose of picking up the messages of more than a score of American amateurs, delivered an especially interesting address at this show. Mr. Godley said in part:

Whether at peace or war, no nation could possibly possess a greater asset than a great body of radio amateurs—practical young scientists in diligent pursuit of the last word in communication. The story of prog-

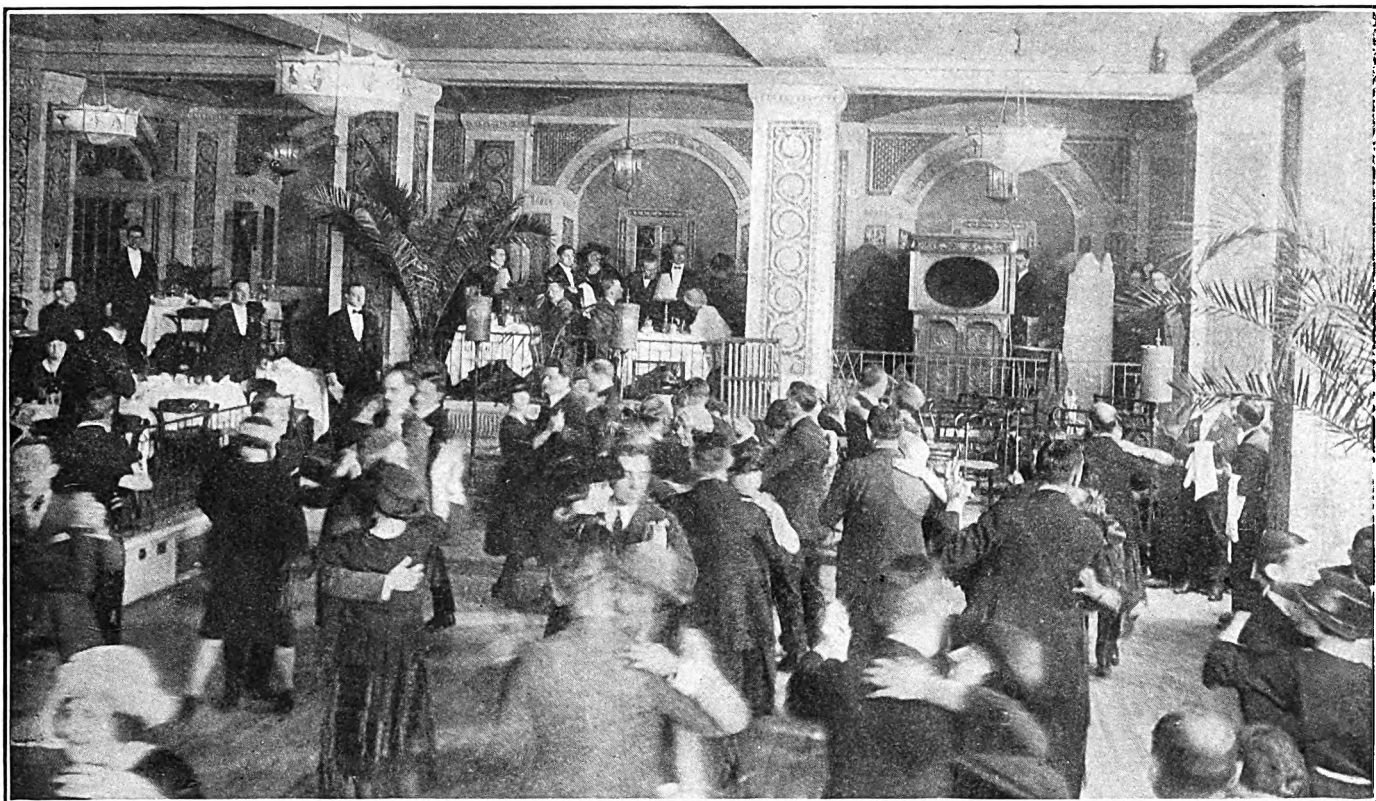


The Lyradion Concert Grand, built to fill a concert hall with radiophone music. Heard at the recent Radio Show in New York.



The first "wireless mailman," the invention of E. D. Glavin of Tuckahoe, N. Y., on view at the Radio Show. (c. by Keystone View Co.)

Carries New York By Storm



An innovation at the Radio Show, Pennsylvania Hotel, N. Y. C., was the dance held in the dining room while the music was furnished by radio. (c. Keystone View Co.)

ress in our lifetime is written by communication methods. The high spots in our progress during the next decade are now being reached by radio telephony and telegraphy.

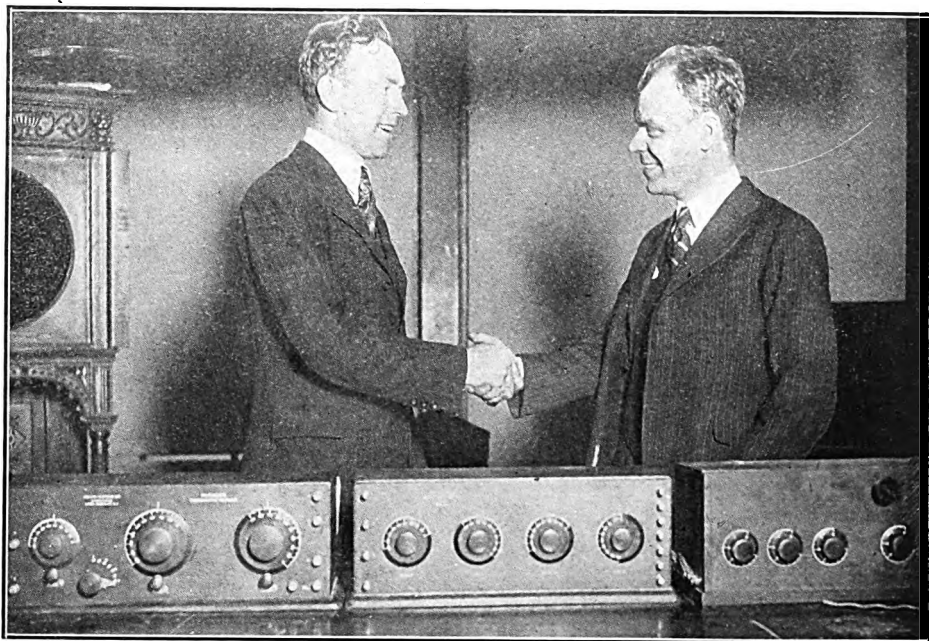
A few months ago the world at large, as represented by the great public, knew very little concerning radio communication methods. As the result of a great love for their hobby, radio amateurs have so perfected these communication methods as to demand the attention of the entire world.

A few months ago only America in the least degree encouraged operation of amateur radio plants. American radio amateurs have rapidly forced all the great nations of the world, as a matter of self-interest and self-preservation, to initiate a policy of encouragement for this sort of work.

Now we have Holland taking every advantage of radio phone broadcasting. Mexico follows with a similar policy. South American republics are greatly interested in the possibilities of this wonderful thing, and only recently, to the great surprise of amateurs in America, France has legalized amateur transmitting and receiving stations in a thorough fashion.

This points unmistakably to that time, now almost here, when the free exchange of private radio communications between the citizens of all lands will occur at more or less regular or frequent intervals. Ready

communication is the bond of a nation. This sort of communication will prove a real world bond, too. America may well be proud of the accomplishments of her 30,000 radio amateurs.



Two famous operators meet at the Radio Show. Jack Binns (right), who was wireless operator on the famous "Republic," and Paul F. Godley, who received the first trans-Atlantic wireless phone message. (c. Keystone View Co.)

Pianist Broadcasts Program of Detroit Symphony

By Dixie Hines

It is probable that the first time a complete symphony orchestra concert has ever been broadcasted by wireless was when, in Detroit, at Orchestra Hall, Ossip Gabrilowitsch, the famous pianist and conductor of the Detroit Orchestra, assembled his organization. Before an audience that taxed the capacity of the Orchestra Hall, he gave a full and complete program which filled not only the hall but the air as far as the radio carried with Mendelssohn's "Calm

Sea and Happy Voyage," with which the program was inaugurated, and thereafter the regular program, as scheduled, was given exactly as it had been planned. Tschaikowsky's Sixth Symphony was the principal number, and when the concert was ended a new chapter written in musical history, Director Gabrilowitsch, as well as the entire orchestra and Arthur Schnabel, the soloist, were accorded enthusiastic ovation.

"For the first time in the lives of

many who possess these receiving instruments they heard a symphony orchestra," Mr. Gabrilowitsch remarked, "and it will mean a lot to the musical education in the future if this policy is continued."

The experiment was made under the auspices of a Detroit newspaper and the following day more than a page was given over to wireless message received by it from every part of the country, the oceans and many foreign countries.

Pathe News Reel to Use Radio

Emanuel Cohen, representing the Pathe News, a picture news service, has completed arrangements with E. F. Albee, head of the B. F. Keith Vaudeville Circuit, for what is claimed will be the most elaborate radiophone circuit in existence. A new wireless tower is in process of erection on the Pathe building, on Forty-fifth Street, New York City, from which communications will be established with Pathe wireless stations in West Palm Beach, Florida; Portland, Maine; Chattanooga, Tenn.;

Pawtucket, R. I.; Minneapolis, Minnesota; Hampton Roads, Va.; Fort Worth, Texas, and Denver, Col., where messages will also be received and relayed from California.

In addition to this chain, all the Keith theatres are now equipped with wireless apparatus, and in case of any momentous occurrence, in or near any of the Keith cities, they will be put at the disposal of the Pathe News.

Mr. Albee has furthermore directed that every possible effort be

made to facilitate the work of the Pathe organization in such emergencies as may arise.

From his headquarters in New York Mr. Cohen will be able to direct by wireless the activities of reporters and cameramen at the scene of disaster no matter how remote it may be. In line with this latest Pathe wireless project, was the recent Pathe feat of flashing on the screen in Keith theatres pictures of the ill-fated Roma a few hours after the disaster which wrecked the dirigible.

Advertises New Houses Wired For Radiophone

In Philadelphia the popularity of the radiophone was reflected in an advertisement appearing in newspapers in which a local builder announced that the \$1,000,000 worth of houses he is building will be wired for radio telephone service. This, of course, will add greatly to the saleability of these new homes.

Radio in Boiler Plate

The expected has happened. Radio telephony is being covered by the big newspaper syndicates that furnish country newspapers with what is known as "boiler plate." This is good for radio as a science, an amusement or a business. The more radio knowledge is circulated, the better it will be for everybody concerned directly or indirectly with the field.

Canadian Regulations

The radio regulations of the Canadian Government are expected to allow amateurs to use a wave length of 200 meters for spark and 250 meters for continuous wave transmission.

At Station W.N.O.



A wireless phone transmitter and operator Station, W N O in Jersey City, N. J. (c. Keystone View Co.)

How One University Does It

University of Minnesota---WLB-9XI

Because of the great number of letters received at the University of Minnesota, acknowledging reception of WLB or 9XI broadcasts and requesting information concerning schedules, apparatus, etc., it has been impossible for the University officials to answer all inquiries by personal letter. They have, therefore, issued a bulletin to cover most of the points mentioned in the letters.

All market and weather broadcasts sent out from the University of Minnesota Station under the call letters WLB are supplied through the mutual co-operation of the Minnesota State Department of Agriculture, the United States Bureau of Markets and Crop Estimates, the United States Weather Bureau and the University of Minnesota. The transmitting schedule of the University station is as follows:

Beginning at 12:00 Noon—Weather forecasts for Minnesota, Wisconsin, North and South Dakota and Montana followed by a press report covering prices, supply and demand on live stock at the South St. Paul market.

Beginning at 7:30 P. M.—Closing cash and future prices on Minneapolis wheat (all important grades) followed by a press report covering the Minneapolis-St. Paul potato market.

Market broadcasts are sent on a wave length of 485 meters first by radio telegraph then, immediately following, by radio telephone. The speed of transmission is about 10 words per minute. The conservative daylight range of the radio telegraph set used is about 250 miles while that of the radio telephone set now in use is about 40 miles.

It is expected that forms for abbreviating all broadcasting will be used in the near future. Special forms for interpreting these abbreviations are in process of preparation and will be issued to all receiving stations desirous of making use of market broadcasts.

A weekly radiophone concert is given on Wednesdays from 7:45 to 9:00 P. M. on a wave length of 360 meters. Programs for these concerts are specially prepared and include only worth while music. Special concerts given by noted artists at the University are sent out from time to time throughout the year.

Reports on reception of signals and suggestions for betterment of service are solicited.

The bulletin is signed by C. M. Jansky, Jr., Director, H. C. Forbes, Chief Operator, University of Minnesota Radio Station, Minneapolis, Minnesota.

Here is one week's broadcasting program of the University of Minnesota:

(Notice: All times given on this sheet are Standard Central Time.)

W. H. A.

DAILY, EXCEPT SUNDAY

Radio Telegraph Broadcast, by 4KW Spark, on 485 meters: 12:00 to 12:15 p. m. MARKET REPORT by Wisconsin Dept. of Markets, co-operating with U. S. Bureau of Markets and Crop Estimates. 12:20 to 12:25 p. m. WEATHER FORECAST for Wisconsin, by U. S. Weather Bureau.

Radiophone Broadcast on 485 meters: 12:25 to 12:30 p. m. WEATHER FORECAST, by U. S. Weather Bureau. 12:30 to 12:35 p. m. Special Notices and Announcements. On Saturdays, announcement of our complete broadcasting program for the following week.

12:40 to 12:55 p. m. MARKET REPORT, by Wisconsin Dept. of Markets. 12:59 to 1:00 p. m. TIME SIGNAL.

FRIDAY:

Radiophone Broadcast on 360 meters: 8:00 to 8:45 p. m. radio

concert, Edison Phonograph and Special Features.

8:45 to 8:50 p. m. announcement of program for following week.

SATURDAY

Radiophone Broadcast on 360 meters: 1:05 to 1:25 p. m. LECTURE on Radio Subjects, preceded by Music.

ADDITIONAL BROADCASTS:

By Radiophone on 360 meters wavelength: Frequently, additional features will be sent out, such as local concerts by famous artists, or by University musical organizations, special lectures or speeches, and reports of athletic contests. Whenever possible, advance notice of such events will be included in the announcements on Friday night of the preceding week.

INTERCOLLEGIATE NEWS EXCHANGE:

(Western Conference Radio News Service)

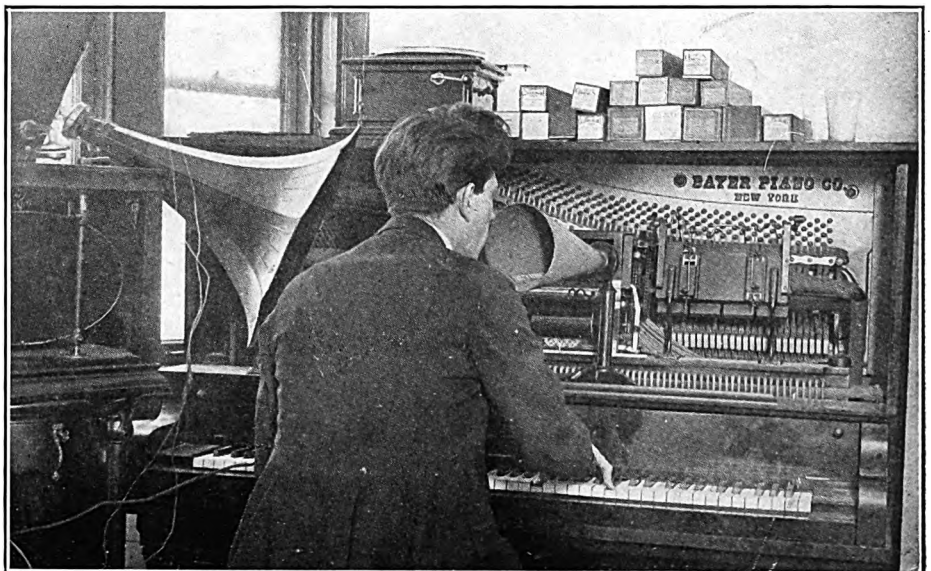
By Continuous Wave Telegraph, 410 meters: Monday, 10:00 to 12:00 p. m. NEWS Items received from other Universities.

Midnight to 1:00 a. m., Tuesday, Broadcast Distribution.

RADIO EXPERIMENTAL STATION 9XM

Wednesday, 10:00 to 12:00 p. m. TESTS and Experimental Message Traffic with Amateurs, by Spark, C. W., or Radiophone, on 375 meters. Other tests from time to time, at irregular intervals.

He Gets His Effects



The larger horn gets the tones of the piano while the smaller one receives his voice. (c. Keystone View Co.)

Where to Reach U. S. Radio Inspectors In Various Districts

RADIO World is in receipt of a communication from the Department of Commerce, Bureau of Navigation, at Washington, D. C., informing us that the law regarding radio telephone service should be upheld and in no way violated.

The law states that amateurs are required to obtain a license from the Bureau of Navigation, providing they have transmitting sets. No matter what power is to be used, the license must cover the station.

Amateur stations are not permitted to broadcast at the present time, but those who have spark transmitters must obtain a license. Failure to obtain a license will result with a fine or imprisonment.

Amateurs having only radio phone receivers are not required to hold licenses, but bear in mind that when

any transmitter installed, the amateur must obtain a license.

Below is a list of government radio inspectors, where license and information may be obtained:

Radio Inspector, Customhouse, Boston, Mass.

Radio Inspector, Customhouse, New York, N. Y.

Radio Inspector, Customhouse, Baltimore, Md.

Radio Inspector, 205 Citizens' Bank Building, Norfolk, Va.

Radio Inspector, Customhouse, New Orleans, La.

Radio Inspector, Customhouse, San Francisco, Calif.

Radio Inspector, 2301 L. C. Smith Bldg., Seattle, Wash.

Radio Inspector, Federal Building, Detroit, Michigan.

Radio Inspector, Federal Building, Chicago, Illinois.

effective amplifying purposes. These are so called cascade amplifiers, which make use of the amplifying properties of the three element vacuum tube or audion.

Different Types of Good Amplifiers Now In Use

In radio communication, the radio signals sent out by a transmitting station are made up of alternating currents and E.M.F.'S which in a tuned receiving antenna circuit, are then coupled or connected to the detector and telephone receiver circuit. In many cases, the energy received in the antenna circuit is so extremely small that after being transferred to the telephone receivers it is too small to operate them properly and no sound, or only a very weak signal, is heard. It then becomes necessary to amplify the received signals.

There are several types of mechanical amplifiers in use that are not adaptable to radio frequency currents. The vacuum tube amplifiers on the other hand have been very successfully applied to this purpose.

The three element electrode vacuum tube is inherently an amplifier of signals. In connection with power amplification it may be easily said that the plate circuit of the tube which comprises resistance and inductance, may be adjusted for maximum power amplification by a suitable choice of its constants. This amplification, due to the detector tubes, however, is frequently insufficient, and it has been found necessary to use several tubes in succession for

Listening In On "The Perfect Fool"

That the radio entertainment given recently by Ed Wynn, "The Perfect Fool," was far-reaching, there is no doubt. Read the following penned from Rangeley, Maine:

Mr. Ed Wynn,
George M. Cohan Theatre,
Broadway, New York City,
Dear Sir:—

Altho we are away up in the "wilds" of Maine we greatly enjoyed your play "The Perfect Fool" last night.

We tuned in about five minutes after the performance began with our entirely home-made apparatus; the regenerative tuner being made of tubular ice-cream cartons, tea kettle knobs—spools and upholstery tacks. The detector apparatus was also home-made, consisting of one radio-trom tube U. V. 200.

We received the whole program in a very clear and distinct tone without interference from other stations.

We would greatly appreciate picture and literature of the above as you mentioned last evening.

Yours very truly,
Percy E. Dennison."

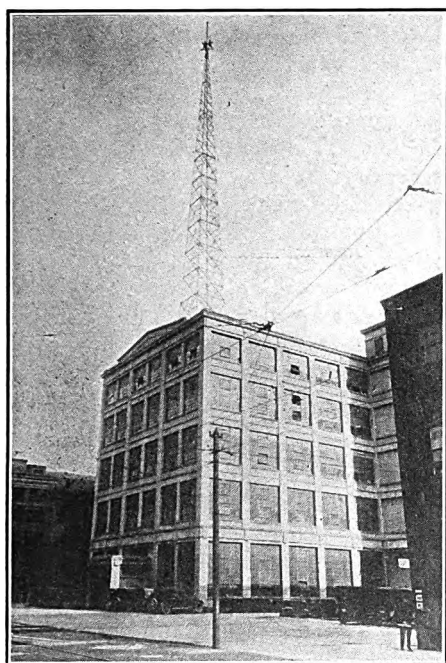
This is only one of the thousands of letters received at the George M. Cohan Theatre.

Wireless Concert At Home

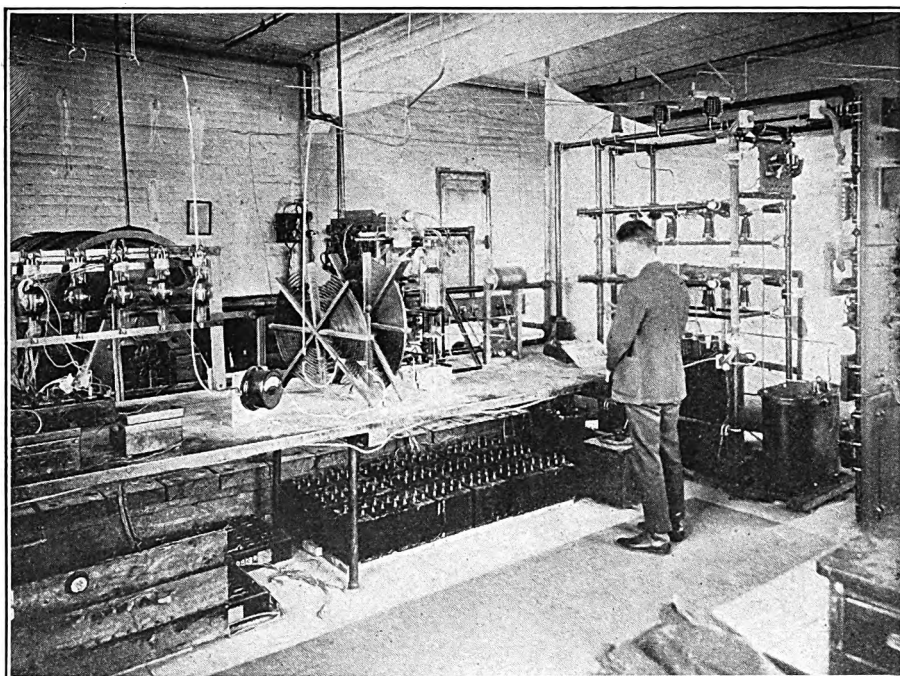


Florence Healy, an 11-year-old concert singer, is seen here giving a few of the latest jazz songs to the receivers. Particular attention should be given to both transmitters, as they combine with each other when leaving the aerial. (c. by Keystone View Co.)

Wonderful Long-Distance Results



Two aerial towers, 183 feet high, mounted on a five story factory at the Schenectady works of the General Electric Company, support the antenna.



Interior, showing the apparatus which amplifies several thousands of times, then reaches out to space at the rate of 186,000 miles per second, of the wireless broadcasting station at the Schenectady plant of the General Electric Company. This station, in tests, has been heard as far as Santa Clara, Cuba, which is a full 1,450 miles distant.

The huge antenna supported by two towers, 183 feet in height, represent the lofty aerial, which is mounted on a five-story factory, at the General Electric Co. plant at Schenectady, N. Y. Due to its effective height, wonderful long distance results are obtained.

The interior shows the apparatus which amplifies the voice several

thousands of times, then hurls it out through space at the rate of 186,000 miles per second. This station is one of the most powerful radio stations in America and in tests has been heard as far as Santa Clara, Cuba, approximately 1,450 miles. "Don't stop your music, we're dancing to it down here" read a cablegram received recently from a hotel

in the Cuban city. The music kept up.

The General Electric station operates on a wave length of 360 meters, under the call letters WGY.

Schenectady is the home town of the General Electric Co., and it is there that some of the great wizards of electricity have worked their wonders for the benefit and edification of the world.

Fakers Hurting Industry

By the Editor of the Radio Dept. of the New York "Evening Mail."

Every new art has its fakers. There is a good crop of radio fakers growing up and it is high time that some one exposed their methods of squeezing sales out of unwary purchasers.

This writer recently witnessed a demonstration where a loud speaker was connected to a crystal receiver that was being sold for less than fifteen dollars. Nothing but the loud speaker and the receiver was in sight.

The entire outfit was set up in a location where only an expensive receiver would have served. Yet there was a little crystal set feeding a loud speaker with currents of such great magnitude that the volume of sound was sufficient for a crowd of fifty people or more!

Every listener was a babe in arms as far as the mysteries of wireless

were concerned, and outfits were being sold. Of course, every one thought they were going to get the same wonderful results. The disillusionment was yet to come.

The writer did not get a chance to peep back under the counter but he is betting a new Sunday hat that at least one vacuum tube detector and five stages of amplification were used in this trick.

Hence Our Type

We agree with the following from the New York "Morning Telegraph," and which is reprinted for the purpose of clearly illustrating our idea of the importance as well as attractiveness of a handsome readable type:

Lord Riddell, British publisher, who has been the liaison officer between the British delegation at the limitation of armament conference in Washington and the newspaper men, sailed yesterday for home on the Orbits.

Lord Riddell, who is the publisher of a weekly with 2,000,000 circulation, stated his belief that for the most part the main type of the body of American newspapers was too small for the eyesight of the average reader to grasp without eyestrain.

"Some time ago the British publishers found the type used was too small and changed for a larger size," he said to the newspaper men, "and I think the same change could be made to advantage in the majority of American newspapers. I believe it is a contributing cause to the poor eyesight of many of your people, for I will admit they are omnivorous readers."

The Wireless and the Singer



Showing an operator sending music over the wireless phone. The horn is attached to the telephone through which the voice comes. This in turn is sent out through another phone and reaches the receiver.
(c. Keystone View Co.)

What a New York Editor Thinks of the Radio Phone

THE radio telephone is one of the latest contributions of science to humanity. It is, briefly, a means whereby the voice of a speaker or the song of a singer can be heard in natural tones at distances of hundreds or even thousands of miles.

Special receiving apparatus must, of course, be used to hear the messages sent out from the transmitting stations. These instruments, are, however, surprisingly simple and, except for the longest distances, can be operated by anyone without technical experience. All that is necessary is to run a well-insulated wire, preferably over 50 feet long, from any two convenient points, such as the house and garage, and connect the receiver to it. The radio waves, sent out by the transmitting station in all directions at the rate of 186,000 miles a second, strike this wire and induce in it currents corresponding to those generated by the sound waves in the transmitting station. These currents are caught by the receiver and transformed back into sound again, and thus the listener receives the message just as it was delivered.

Some of the economic aspects of this new enterprise are very interesting. It has, in the first place, created what is practically a new industry, heretofore very limited. It is now running into many millions of dollars annually. It is also benefitting the nation by providing farmers with a means of getting instantly, news, market reports, weather forecasts, and other useful data, and also by making his farm a much more attractive place for his family than it has been heretofore. That this will have some influence in improving agricultural conditions, can hardly be doubted.

For the average dweller in a town or city, it has great educational possibilities, as it brings to him music and ideas of a kind that he would never otherwise get. Nor must its special ability to bring the services of the church into the home be overlooked; there is a power for good in this that can hardly be overestimated. What the future will bring forth is difficult to determine with certainty, but that this system will have far-reaching social and economic results is beyond question. — William H. Easton, Ph. D., in *Forbes Magazine*

Farmer to Get Radio Crop Reports

The farmer need be no more than thirty minutes behind his city brother in receiving news by radiotelephone of the factors that determine prices of agricultural products.

The radio system will cover the territory of Chicago to within 500 miles of the city. In this area there are thousands of radio sets, in villages and farms. Even on farms where there is no apparatus there are telephones and the nearby village will have the radio reports.

Hello, London!

Vice-President John J. Carty, of the American Telephone and Telegraph Co. has told the Public Service Commission: "We should be able to talk to South America soon, and we know now we can talk to London." He stated farther that radio telephony would supplement but not displace the use of wires.

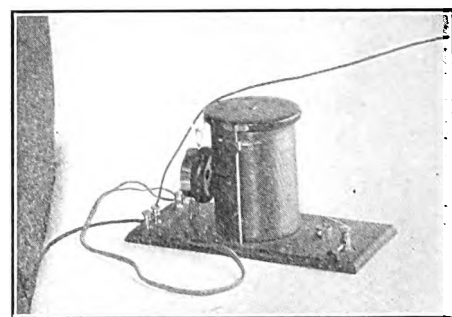
Due to new inventions and developments, the telephone service will improve. This may not come to pass for five or ten years, but the telephone systems in the east in a few years will be "Blizzard proof."

The radio field is at present limited to communication with ships broadcasting, and several other special services, both civil and military, but due to lack of secrecy and to atmospheric disturbances, there is still much to be done in the way of further experiments.

The Most Sensitive

The vacuum tube employed in radio today is known to be the most sensitive electrical device ever invented.

A Modest Home Radio Service



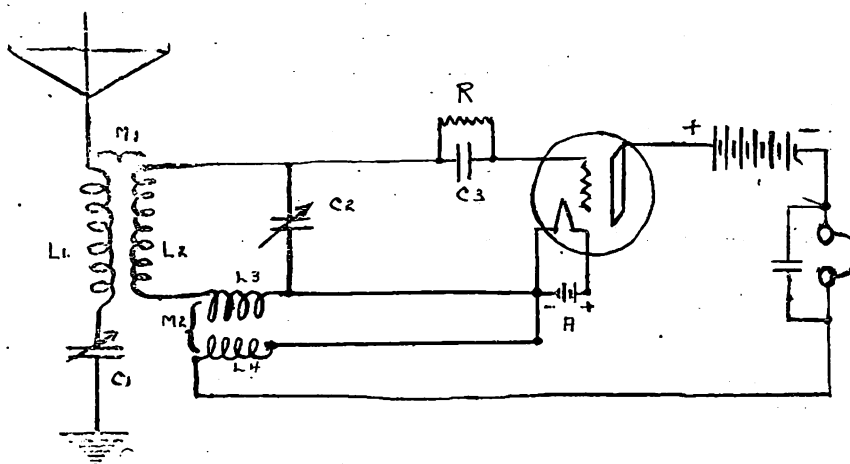
When one can get a set as small as this that will receive broadcasted programs within a radius of 25 miles, there is no reason why any home should be without this most modern of entertainers.
(c. Keystone View Co.)

A Tried-and-True Receiver

THIS illustration shows a receiving circuit, using one three electrode vacuum tube, for detection and amplification. The tuned antenna circuit comprises the aerial, inductance L1, variable condenser C1, and the ground. Coupled to this circuit is a vacuum tube detector circuit, with coils L3, and L4, inserted in the grid and plate circuits, respectively, and coupled to each other.

An incoming damped oscillation sets up an oscillatory current, in the antenna circuit L1, C1, of the same frequency and general damping characteristics. Through the coupling M1, of the antenna circuit and the secondary tuned circuit L2, C2, L3, energy is transferred to the latter, setting up in it a damped oscillatory current.

The resulting alternating difference of potential, between filament and grid of tube, produces pulsations of the plate current, at the same frequency as the oscillations of the circuit C2, L2, L3. In other words, an alternating current is superimposed



A Regenerative Circuit Employing Two Coils, One in the Grid and Plate Circuits, Coupled to Each Other Respectively.

on the normally unvarying current in the plate circuit. This alternating current, flowing through the coil L4 induces in the coil L3 an emf. which, under conditions to be set forth, is in phase with the oscillatory emf. operating in the circuit C2, L2, L3. In other words, energy is synchronously supplied by the plate circuit, to the oscillatory grid circuit, which

partly compensates for the resistance losses in that circuit, and thereby increases the amplitude and decreases the damping of the oscillation.

The duration and amplitude of every incoming wave train, as impressed upon the grid of the tube, are thus increased, and the signals heard in the telephone receivers are correspondingly louder.

Tips For Fans

To reduce the howls and noises coming through your receiving set, sheath your cabinet inside with copper sheathing, aluminum sheathing, or use tinfoil in sheets. Do not use any glue, use paint with shellac, and stick the tinfoil to the wet shellac. Glue is not an insulator.

When this has been done, let the shellac dry so the tinfoil is actually stuck to the cabinet, and then ground the entire sheath to the grounding binding post. If you cannot obtain tinfoil from a store, tinfoil from cigarette boxes will answer the purpose.

Another tip: place between the tubes aluminum or copper sheets and ground these also. This will tend to prevent all body capacity effects from entering your receiver and much of the howling will be lost.

An Ocean Conflab

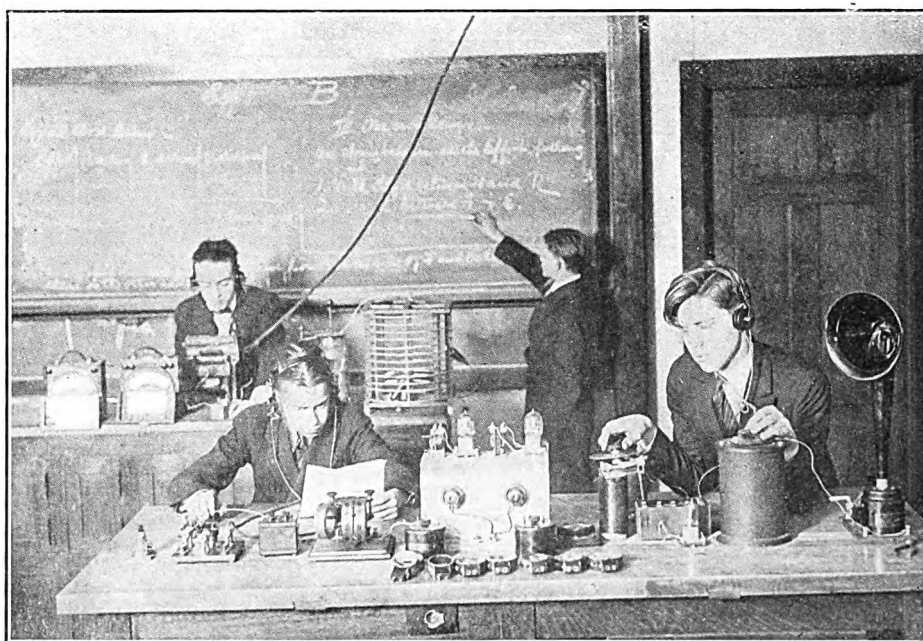
A ship to shore wireless telephone call with an ordinary telephone instrument was achieved recently. Engineers of the American Telephone and Telegraph Co., and the American Radio Corporation, carried out the successful experiment. Captain William Rind, on board the steam-ship "American" talked to H.

B. Thayer, president of the telephone company in his home at New Canaan, Conn.

This experiment demonstrated, officials of the telephone company said, that it would soon be possible to call ships hundreds of miles at sea and

to talk with friends on board as easily as one now can telephone to New Haven or Philadelphia. Telephone company officials said that they had talked to the "America" when she was 1,600 miles out. The experiment lasted for a period of 30 minutes.

First Radio High School Class



The First School to Teach Radio to Its Pupils is the Central High School of Washington. Here Pupils of the Radio Class Are Diligently Tapping Keys of Their Sending Sets While Others Receive and Transcribe the Various Messages Floating Thru the Air.

(c. Keystone View Co.)

Radio Merchandising

A Department of Service for Dealers
Selling Campaigns and Problems

Dealers—
Are You Equipping Yourself To Get
Your Share of Sales of
10,000,000 New Radio Sets
That the Public Will Demand In the Next Few Months?

Read RADIO WORLD
And Get the Trade Angles of This Wonderful
New Science and Industry

The publishers of RADIO WORLD, knowing how great a factor the dealer is in a business so important as that of radio merchandising, have decided to start this department with the initial issue of the publication and to continue it as a regular feature from week to week.

The various problems of retail merchandising, as related to the question of selling radio goods of any kind whatsoever, will be discussed in this department.

The experiences of dealers in the stocking and selling of radio goods will be given space here, so that the good points of selling will be accentuated and the wrong methods be called to the attention of dealers.

Over-the-counter propositions of various kinds, and of big or small importance, will be covered; the object in mind being to make this department a real business help to every individual or concern engaged in the retail selling of radio goods.

Business talks with men whose opinions are worth putting into type will be published from time to time.

Personality—that is, pictures of and interesting facts about the men who prove that they are leaders among the merchandisers in this great field—will also be made an important part of the trade section.

Sales arguments, tabulated answers for your salesmen to make to the queries of prospective buyers, and the many other angles that are interesting and call for explanation or advice will be made a part of the message of these pages.

If you have anything to suggest—

Write us.

If you want advice—

Write us.

If you want to have any problems solved—

Write us.

And we promise to give your letters our earliest and most conscientious attention.

Address, Editor, Trade Department, RADIO WORLD.

Trade News and Gossip

Timely Stimulant for Electrical Trade

Wherever the sign of "Radio Supplies" is displayed today, activity reigns. It's a call from the general public—thousands of interested persons—buying or about to buy something in radio.

Vast quantities of radio merchandise are being exploited by department stores, through mail order houses, radio stores, electrical jobbers, electrical contractors, sporting goods stores, retail automobile supply stores, drug stores—all serving conscientiously, making earnest effort to accommodate this unparelled call from neighbors, friends, everybody, near and far.

And the radio market—an electrical market—is being supplied—shall and must be completely supplied—so that no radio enthusiast shall be

disappointed in getting his set or any parts he might want for it.

Manufacturers of:

Copper wire for electrical purposes.
Electrical insulation materials.
Amplifying tubes
Machine screw products
Storage batteries
Dry batteries.

are loaded down with orders and seem to find it extremely hard to "catch up" with the continued demand—but everybody is working hard to supply the demand.

Yes, radio has strongly stimulated a very large part of our electrical producing capacity, and marketing capacity, too.

"Hitch your wagon to radio and get your share of this big business."

L. FRANCIS TISSOT.

New Radio Corporations

Radio Appliance Corp., New York, \$20,000; C. D. Koerner, W. J. Garvey, F. R. Fox. (Attorney, C. S. Aronstam, 100 Broadway.)

Teleradio Engineering Co., Manhattan, wireless machinery, \$5,000; T. W. Kirman, H. M. Lintner, M. N. McCullough. (Attorney, W. W. Geddes, 79 John St., N. Y. C.)

Air-O-Phone Corp., Manhattan, capital increased from \$50,000 to \$500,000.

Radio Stores Corp., New York, electrical disc, 1,000 shares common stock, no par value; active capital, \$21,000; M. A. Hogan, T. W. Cummins. (Attorney, S. D. Jones, 120 Broadway, N. Y. C.)

American Radio-Phone Sales Corp., Queens, \$12,000; G. Schubel, E. G. Raeder, F. Sprower. (Attorney, Ridgewood R. Times, Myrtle and Cypress Aves., Brooklyn, N. Y.)

Home Radiophone Corp., Manhattan, changes name to Home Radio Corp.

McPhilben Radio Electric Corp., Jamaica, make instruments, \$20,000; M. Fisher, M. Jacobs, M. Bernstein. (Attorneys, Fisher & Deima, 38 Park Row, N. Y. C.)

United States Wireless Corp., Manhattan, make apparatus, \$20,000; H. and J. and R. Uswald. (Attorneys, Stone & Glaser, 116 Nassau St., N. Y. C.)

Premier Radio Corp. of America, Manhattan, \$20,000; D. and J. Bloch, O. Wechsler. (Attorney, M. Schwebel, Woolworth Building, N. Y. C.)

Dodge Radio Corp., Manhattan, \$10,000; P. C. Flint, P. F. and J. H. Cortese. (Attorney, Republic Industrial Co., 1 East 42nd St., N. Y. C.)

Radio Receptor Co., Manhattan, merchandise, \$5,000; H. Cohn, V. Greiff. (Attorney, H. Glasser, 276 5th Ave., N. Y. C.)

Mignon Electric Mfg. Corp., Rochester, \$25,000; E. C. Mignon, A. L. and R. C. Howard. (Attorneys, Lynn Bros., Rochester.)

S. & H. N. Radio Supply Co., Manhattan, \$10,000; L. and M. Sanger, J. Nugent. (Attorney, M. Greenberger, 1,133 Broadway, N. Y. C.)

Rochester Electric Equipping Corp., Ro-

chester, \$15,000; H. Benzon, N. C. and A. Plank. (Attorney, N. E. Spencer, Rochester, N. Y.)

Philadelphia Radiophone Co., Philadelphia, \$100,000. (Corporation Guarantee and Trust Co.)

National Radio Electric Corp., Wilmington, Del., increased capital from \$300,000 to \$1,200,000.

Radio Equipment Products Corp., Manhattan, \$100,000; G. W. Rocklein, J. C. White. (Attorney, J. G. Fenster, 206 B'way, N. Y. C.)

United Radio Corp., Wilmington, Del., instruments, \$750,000. (Corporation Service Co.)

Another Radio Show

The International Travel Exposition arranged for a Radio Show section this week at the Grand Central Palace, commencing March 25, and ending April 1.

Prominent concerns in the industry will exhibit the latest goods of interest to the traveler, along with the exhibition of radio equipment.

Scores of Radio exhibitors have reserved booths, including the following:

Independent Wireless Telegraph Co.

Times Appliance Co.

Novo Manufacturing Co.

Franco Electric Corp.

Radionola Manufacturing Co.

Gould Storage Battery Co.

Lexington Radio and Electric Co.

Everett Manufacturing Co.

Prest-O-Lite

General Apparatus Co.

Wireless Appliance Co.

Herbert & Huegson Co.

Improved Type of Amplifier by Skilled Craftsman

The Federal Telephone & Telegraph Company of Buffalo has recently placed on the market, new amplifying units which are very unique in design and extremely efficient in operation.

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The cabinets are finished in a black satin enamel. Metal partitions in the cabinets serve to shield the separate stages of amplification from interacting with one another, thereby eliminating the usual howling due to audio frequency feedback. These partitions place each stage in a separate compartment. A separate rheostat is supplied in



An efficient two step amplifier

each stage, thus making possible the best adjustment from each stand, independent of the others, and assuring through the gentle heating of the rheostat the maintenance of each compartment in an absolute moisture-free condition.

The units are equipped with Federal automatic filament control jacks, which provide a convenient and rapid means of shifting the telephones from one step to another without necessity of adjusting filament rheostats. They are so connected as to cause the insertion of the telephone plug in any stage to light only those filaments required by that stage of amplification. The use of the automatic filament control jacks greatly increase the useful life of the vacuum tube and the drain on the filament battery is reduced to a minimum.

RADIO WORLD'S QUICK ACTION CLASSIFIED ADS

This department is intended for everybody who wants quick action on short announcements covering the buying, selling, exchanging or general merchandising in the radio field. Readers of RADIO WORLD will find that it pays to read these columns every week. Advertisers will get a sixty-hour service here—that is, copy received for this department will appear in RADIO WORLD in about three days after copy reaches us.

The rate for this RADIO WORLD QUICK ACTION CLASSIFIED AD. DEPT. is 5c. per word (minimum of 10 words, including address), 10% discount for 4 consecutive insertions, 15% for 13 consecutive insertions (3 months). Changes will be made in standing classified ads., If copy is received at this office before 4 P. M. on any Monday preceeding date of publication. RADIO WORLD CO., 1493 Broadway, New York City. (Phone, Bryant 4796.)

Government Positions. Men, women, 18, over. Wanted for Railway Mail, Postoffice, other Government positions. Examination soon. Salary \$1,400-\$1,500 year. Experience unnecessary. Particulars free. Write Columbia School of Civil Service, 383 Pope Bldg., Washington, D. C.

Amateurs Attention.—We are 4 blocks from Grand Central station. Variometers & Couplers \$6. Regenerative sets mounted, unwired \$35. Phones, Tubes, Transformers, Condensers, Aerial Wire Rheostats in stock. Amplifying units \$15. Detector units \$12. Sets made to order. Mail orders receive prompt attention. Open to 7 P. M. Vanderbilt 2038-Murray Hill Electric. 214 East 38th St.

Amateurs, Attention.—\$6 for Variometers and Variocouplers. Regenerative sets, unwired, \$35. Parts of all kinds for sale cheap. Phones, tubes, rheostats and coils. Why go downtown when we are four blocks from Grand Central Station. Estimates cheerfully given. 2 BUA. Murray Hill Electric Co., 214 East 38th St. Phone Vanderbilt 2038.

Audion Renewals.—Any type single stem, tungsten filament, detectors repaired for \$2.75; amplifiers as above, \$3; 5 watt power tubes, \$4; VT-1 oxide filaments and to use 20-35 volts "B," \$3.50. Terms cash, or C. O. D. plus charges. Trumount Laboratory, Milford, Mass.

Agents Wanted.—One live amateur in every town to sell radio apparatus. Attractive discounts given. Write immediately for full particulars. Wilmington Electrical Specialty Company, Dept. C, 705 Adams Street, Wilmington, Delaware.

Advertise.—Country town newspapers. Lists ree. Pennill Company. Covington, Kentucky.

Amateur Agents Wanted in every town to sell radio apparatus. A few stocking agencies still open. Delfelco, 12 Meeting Street, Pawtucket, R. I.

Handbooks for Electricians and Experimenters, 20c. Joe Tillberg, Proctor, Vermont.

Buy Direct From Manufactuerrrs, mahogany cabinet containing short wave tuner with detector. \$30 with one stage amplification, \$45; two stage, \$60; three stages (Use loop), \$80. No jacks. Rear connections. Rogers Radio Company, 5133 Woodworth St., Pittsburgh, Pa.

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We Buy and Sell back issues of Radio Amateur News and Electrical Experimenter. Boston Magazine Exchange, 109 Mountfort St., Boston, Mass.

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Wire.—B. & S. Ga., S. C. C. wire 1/4 lb. lots No. 34 to 36, \$50. No. 30 to 33, 40c; No. 23, 23c; No. 25, 28, 32, 34 enameled, very reasonable. For 1/2 and 1 lb. lots proportionate prices. Write for price and information. F. Benedict, 3916 N. Irving Ave., Chicago.

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Radio Bargains.—50c each postpaid. Phone plugs; 3 contact jacks, work either open or closed circuit; receiving station lighting arresters, carbon gap with high voltage use, on porcelain base, \$1 value; Bakelite 3" diameter tubing, per foot; Ward Leonard resistance tubes, up to 2,000 ohms; non-inductive alloy wire resistance units on wooden spools, any resistance up to 2,000 ohms; six feet No. 5 ground wire flexible 61 strand R. C.; postage not paid on wire. D. C. C. Enam. No. 14 copper wire, 40c pound. Miscellaneous, bargains—change-over switches, for panel mounting with knob, six pole, D. T., \$2 each; same, 2 P. D. T., \$1; same, single pole D. T., 80c; Wheatstone Bridge resistance boxes, with plugs, 6 circuits, \$4.50. F. O. B., Chicago. Twelve hour service on all above. American Radio Supply, 2140c So. Harding Ave., Chicago, Ill.

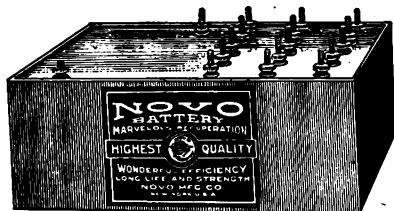
Stop! Look! Act! V. T.'s and accessories!—With each of the listed tubes Radiotron U. V. 200, \$5 and A. P. detectors, \$5; radiotron U. V. 201, \$6.50 and A. P. amplifiers, \$6.50. We will supply free of charge your choice of either of these five premiums—latest Fada rheostat, \$1, No. 810 Remler smooth running rheostat, \$1; Paragon V. T. socket, \$1; Murdock V. T. socket improved contact type, \$1, or Crosley porcelain panel or base mounting V. T. socket, \$0.60. Either of the Federal single, closed or double circuit jacks listed respectively at \$0.70, \$0.85 and \$1 will be given as premiums with each Federal 226W amplifying transformer, \$7 or R. C. of A. U. V. 712, \$7, and the U. V. 1714 radio frequency amplifying transformer. Fada 5 ampere Nichrome power rheostats, \$1.35 or R. C. of A. U. R. 542 porcelain V. T. socket supplied free of charge with each \$8 U. V. 202 5-watt power tube, for C. W. or radiophone transmission. We absolutely guarantee the foregoing apparatus. Only new and high grade equipment carried in stock. Unsatisfactory goods subject to return within five days. Twelve hour service. Postage and insurance prepaid by us, thereby saving time and money. Remember us. The Kehler Radio Laboratories, Dept. R, Abilene, Kansas.

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Settling A Boundary Dispute

Over half a century ago the parallel of 129 degrees East Longitude was chosen as the boundary line between Western Australia on the one hand and South Australia and the Northern Territory on the other, says the "Science News Bulletin" (Washington). But the line had never been accurately laid down. As runs through a wilderness, the uncertainty of the borderline did not matter. The discovery of oil toward the northern end, however, made it desirable to fix the position exactly. Moreover, the states concerned were anxious to avoid a dispute such as that between Victoria and South Australia.

The work of fixing the true border between Western Australia and the states to the east was undertaken by State Astronomer Curlew of West Australia and State Astronomer S. F. Dodwell of South Australia. With a field wireless plant they were able to receive direct the time-signals from the high-power plant at Lyons,

France, and also from Annapolis, U. S. A. After allowing one-twenty-fifth of a second for the transmission of the wireless signals, the position of a point on the 129th degree was worked out at each end of the boundary line, at places over 1,000 miles apart. When asked how nearly to absolute accuracy he had approached in fixing the line Dodwell said, "Well, we're within thirty yards of it. There are two possible sources of error: the personal equation and some defect in the instruments". It all turned out perfectly.

RADIO WORLD

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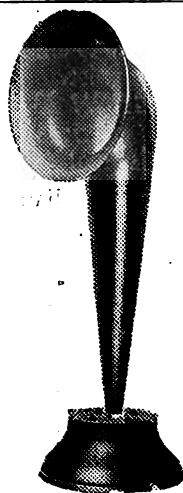
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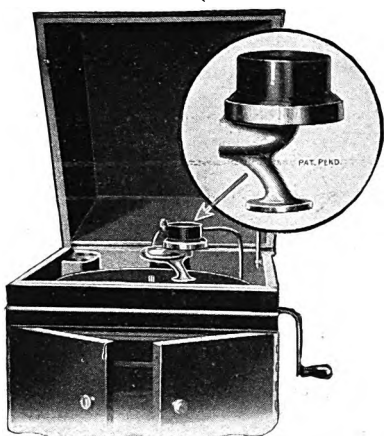
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A Sample Program

WESTINGHOUSE KDKA

SUNDAY, MARCH 26

11:00 A. M.—Services of the Emory Methodist Episcopal Church, North Hiland avenue at Rippey street, Pittsburgh, Pa. Rev. W. Wofford T. Duncan, Minister.

3:30 P. M.—Radio Chapel at Station KDKA, conducted by Rev. W. O. Yates, of the Swissville Presbyterian Church, Swissville, Pa.

7:30 P. M.—Services of the Calvary Episcopal Church, Shady avenue, Pittsburgh, Pa. Rev. E. J. Van Etten, Rector.

MONDAY, MARCH 27

12:30 P. M.—Lenten services from the Trinity Episcopal Church, Pittsburgh, conducted by Rev. Frank H. Nelson of Christ Church, Cincinnati, Ohio.

8:00 P. M.—"Pittsburgh" by C. C. C. Stotler, Secretary and Treasurer, Title Guaranty Company, Pittsburgh, Pa.

8:30 P. M.—Instrumental and vocal duets and solos by John Rodda, tenor; Hazel Drake pianist; Mrs. Oliver S. Heck, contralto; Clyde DeRoy Kocher, violinist, and Mrs. William W. Andrew, accompanist.

TUESDAY, MARCH 28

12:30 P. M.—Lenten services from the Trinity Episcopal Church, Pittsburgh, conducted by Rev. Frank H. Nelson, of Christ Church, Cincinnati, O.

8:00 P. M.—"Modern Photography," by R. W. Johnson, manager Trinity Court Studio, Pittsburgh, Pa.

Weekly talk on dress.

8:30 P. M.—Entertainment by Mrs. Adele Eggers Furniss, soprano; T. F. Willman, violin, and Mrs. T. F. Willman, piano.

WEDNESDAY, MARCH 29

12:30 P. M.—Lenten services from the Trinity Episcopal Church, Pittsburgh, conducted by Rev. Frank H. Nelson of Christ Church, Cincinnati, O.

8:00 P. M.—"Pittsburgh—Its Industrial Importance," by A. L. Humphrey, president of the Westinghouse Air Brake Co. Message from the National Safety Council.

8:30 P. M.—Popular entertainment by Allan's Serenaders of the McKeesport Cyclers, McKeesport, Pa.

THURSDAY, MARCH 30

12:30 P. M.—Lenten services from the Trinity Episcopal Church, Pittsburgh, conducted by Rev. (Continued on next page)

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8:00 P. M.—"Co-Operation Be-
tween Banker and Farmer,"
by Dr. J. T. Holdsworth, vice
president, Bank of Pittsburgh
N. A.

8:30 P. M.—Vocal and instrument-
al selections by W. F. McNal-
ly, baritone; Mrs. W. H. Long,
pianist; also several violin
selections and readings by ar-
tists, to be announced later.

FRIDAY, MARCH 31

12:30 P. M.—Lenten services from
the Trinity Episcopal Church,
Pittsburgh, conducted by Rev.
H. W. Anthony, New Bright-
ton, Pa.

8:00 P. M.—"The Junior Civic
Club and its Accomplish-
ments" by Nellie S. Hoover,
Peabody High School.

8:30 P. M.—Artists from the stu-
dio of Richard Knotts.

SATURDAY, APRIL 1

12:30 P. M.—Lenten services from
the Trinity Episcopal Church,
Pittsburgh, conducted by Rev.
H. W. Anthony, New Bright-
ton, Pa.

3:30 P. M.—Popular concert by
Mason's Orchestra.

7:30 P. M.—Special Children's en-
tertainment. Bird and animal
imitations by Dr. Carlton C.
Anthony, D. D. S.

8:00 P. M.—Talk by speaker to
be announced later.

8:30 P. M.—Entertainment by the
Geneva College Musical Club.

SUNDAY, APRIL 2.

10:45 A. M.—Services of Calvary
Episcopal Church, Shady ave-
nue, Pittsburgh, Rev. E. J.
Van Etten, Rector.

3:00 P. M.—Radio Chapel at Sta-
tion KDKA, conducted by
Rev. John Ray Evans, Pastor
East End Christian Church,
Pittsburgh, Pa.

7:30 P. M.—Services of the Point
Breeze Presbyterian Church,
Fifth and Penn avenues, Pitts-
burgh, Pa., Dr. P. H. Barker,
Minister.

NOTE—The time mentioned is
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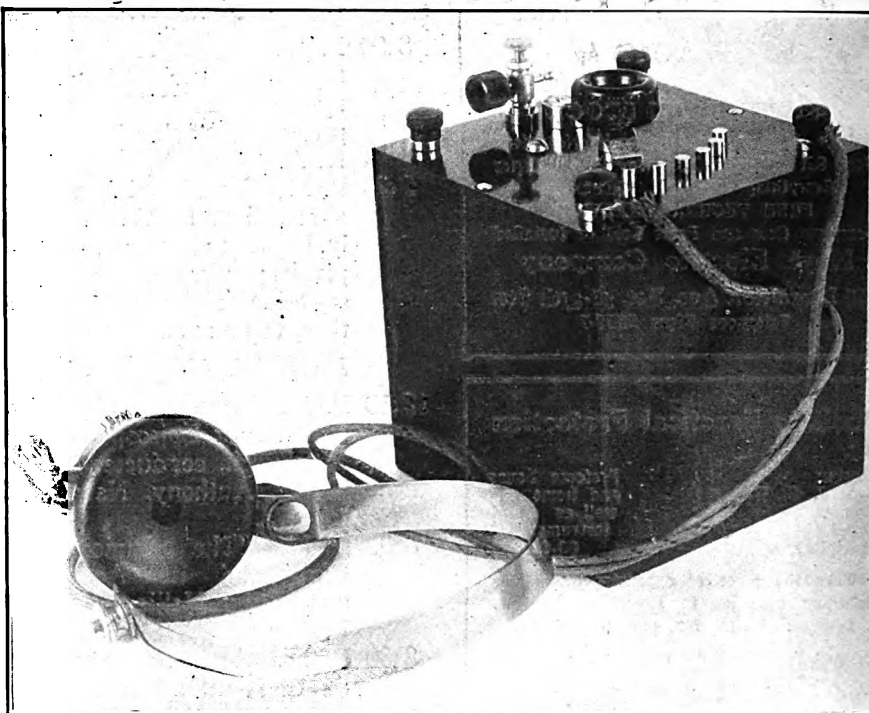
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so clearly is it written, to design his or her receiving equipment from the formulas data and tables contained between its covers.

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"Construction of New Type Transatlantic Receiving Set" by Mr. Sleeper is an excellent book. Among other interesting things the subject of Loud Speakers Relays, etc., is dealt with quite completely.

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RADIO WORLD



(c. Underwood & Underwood.)

Miss Ethel Hart awaiting her morning social call by radio, in her room at the Hotel McAlpin, New York.

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In this issue:

**Radio
Definitions**

and

**Radio
Primer**

for

Beginners

**Special Articles
by Experts**

**OUR AIM IS
SERVICE**

IS RADIOTELEPHONY DEPENDABLE? By O. C. ROOS (Fellow I.R.E.)

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radio necessities

MURDOCK REAL RADIO RECEIVERS have delivered complete satisfaction, on a "money-back" basis for 14 years. Those years of experience have so simplified and perfected our production that there are today no receivers quite so good at so low a price.

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Many of the complete "ready-to-operate" wireless sets now on the market include Murdock Phones as standard equipment. If the set you buy does not, be sure you get a set of Murdock receivers to complete your station. We strongly urge you to go to your dealer and convince yourself of the quality of Murdock receivers, by actual examination, before you buy. Prices \$4.50 to \$6.

Murdock Phones are the standard bearer for a complete line of "Made-by-Murdock" radio parts and instruments. This includes the famous Murdock condensers, couplers and variometers, and the new Murdock Rheostat at \$1.00.

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WM. J. MURDOCK CO.

RADIO WORLD

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A WEEKLY JOURNAL, PUBLISHED EVERY WEDNESDAY AND DATED SATURDAY BY RADIO WORLD COMPANY, FROM PUBLICATION OFFICE, 1493 BROADWAY, NEW YORK, N. Y.

Vol. I. No. 2.

April 8, 1922

15c. per copy, \$6.00 a year

A Joyous Apology

The editors and publishers of RADIO WORLD offer, herewith, an apology to the American public.

An unusually large edition of the first issue of RADIO WORLD was printed. An extra supply was made ready for additional orders from the news trade.

Our first delivery to the American News Company was swept off the newsstands almost immediately after copy reached public sale.

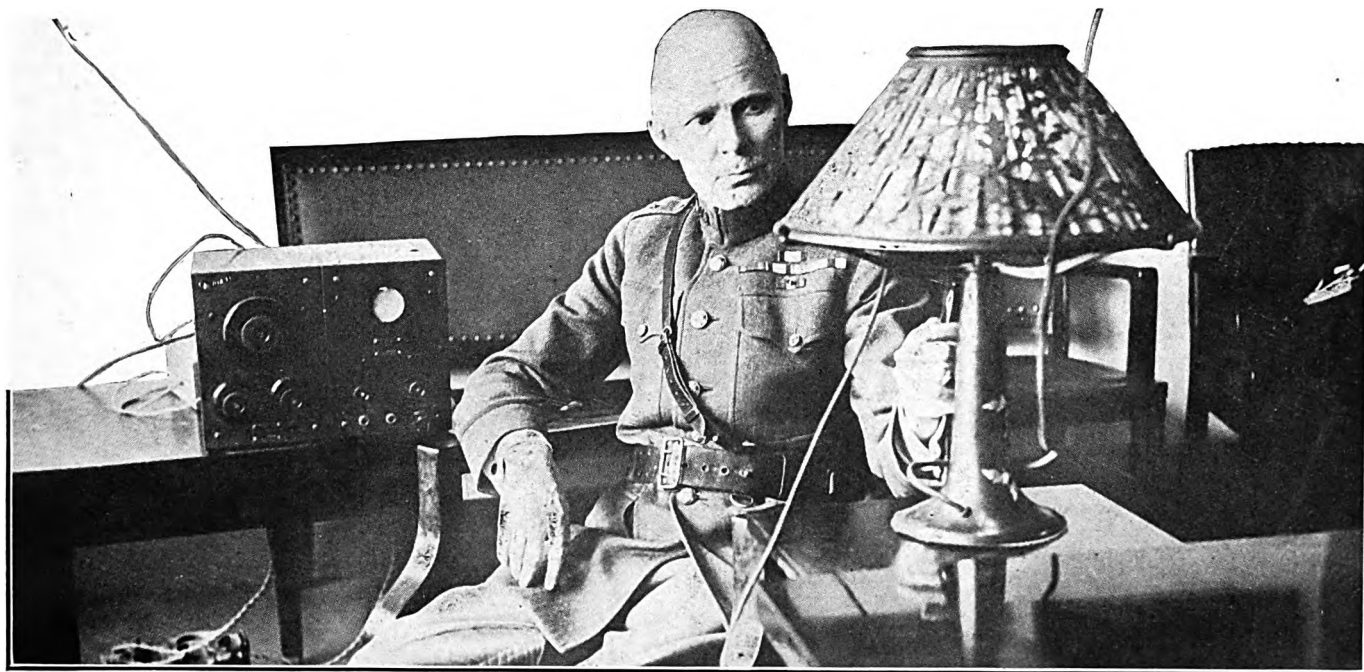
Re-orders came pouring in to the American News Company, its branches and to the publication office. Our entire extra supply was used up inside of twenty-four hours. We are, therefore, many thousands short of being able to supply the demand for the first issue.

Hence our apology for not printing a much larger edition.

This is written within twenty-four hours after our first issue went on sale, and orders continue to pour in—orders which, we regret to say, we cannot fill.

We promise to do our level best to supply the full demand for this second issue in your hands.

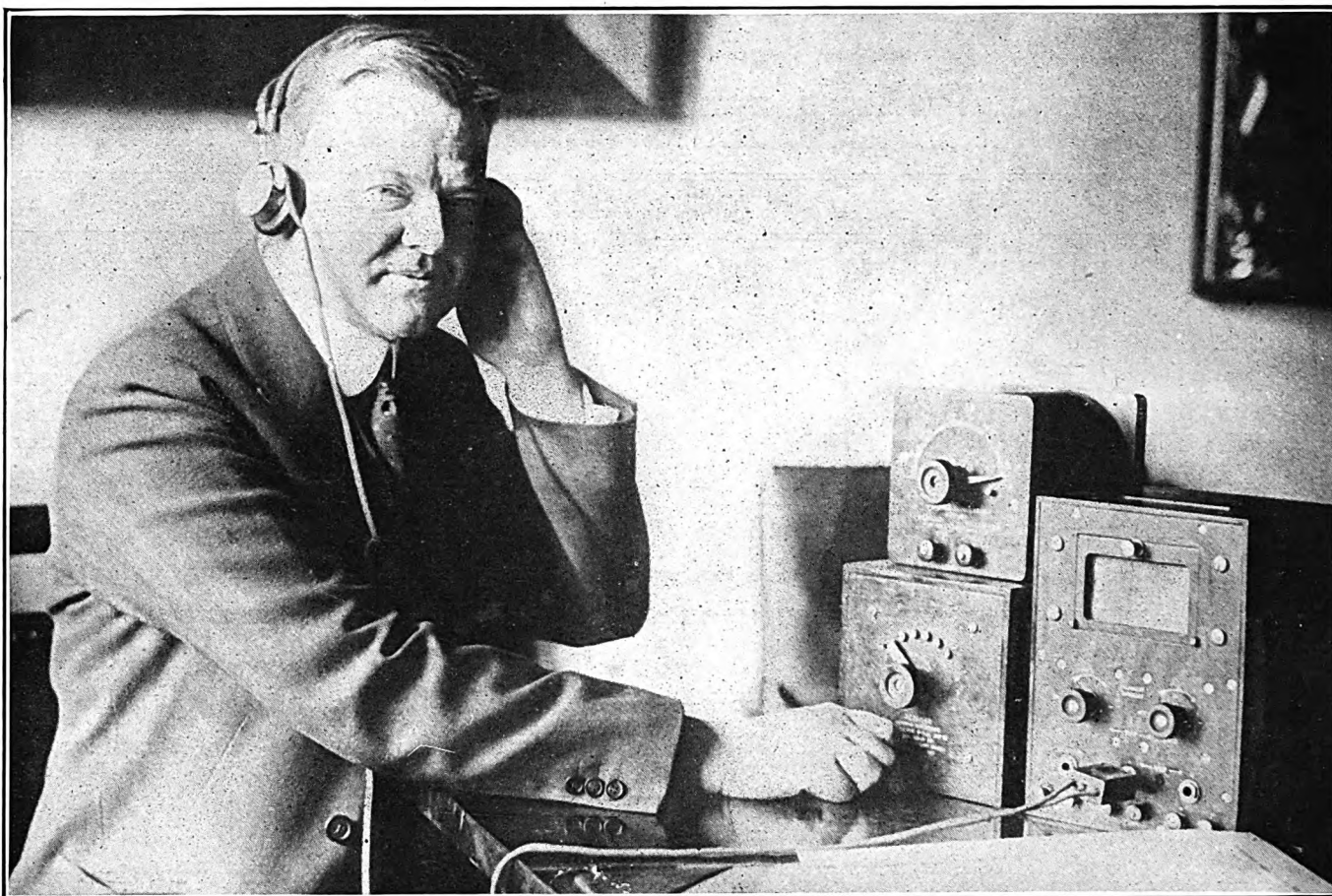
PUBLISHER of RADIO WORLD.



(c. Underwood & Underwood.)

Major-General George O. Squiers, U. S. A., by an invention of his own, receives messages without aerials. The receiving set is attached to the lamp on his office desk, the electric supply forming a receiving source.

Hoover Takes Time to "Listen In"



(c. Underwood & Underwood.)

Herbert R. Hoover, Secretary of Commerce in President Harding's cabinet, is one of the most enthusiastic or radio fans and one of the leading workers in the Radio Conference now being held in Washington to regulate wireless affairs throughout the country. His office is equipped with a radio set. Whenever opportunity offers, the Secretary of Commerce clamps on his head-gear and "listens in"—particularly when there is music in the air.

Storage Batteries for Radio

By Fred. Chas. Ehlert

ALL radio receiving-sets now on the market, equipped with a vacuum tube, require two batteries, technically known in radio as "A" and "B" batteries. The "A" battery is a storage battery of relatively low voltage and high amperage. The "B" battery is a dry battery of relatively high voltage and low amperage.

Certain storage batteries are designed especially for radio apparatus and have characteristics which differ from the storage batteries manufactured for automobiles, telephones, railroad signals, and other special work. Any good storage battery of the required voltage, usually 6 volts, and having a capacity of 40 or more ampere hours, regardless of the work for which it was designed, may be used with radio receiving sets. But such batteries should not be expected to give a satisfactory service as bat-

teries which are designed especially for radio work.

There are a large number of reputable storage-batteries now being made especially for use with the radio sets, and it is very important that the instructions given with them be carried out in detail.

The capacity of a storage battery is governed very largely by the quantity and quality of lead and oxide of lead used in its construction. The amount of service obtained from a charge will depend on the size of the charge and the current drain. You cannot take out of a storage battery any more current than you put into it. Test your "A" battery frequently. There is one method—a very easy one—to estimate the condition of your battery; and that is the use of what is known as a hydrometer. In a storage battery, on discharge, the sulphuric acid of the electrolyte is constantly

forming lead sulphate. This thins the electrolyte, which indicates that when the electrolyte is the strongest, the battery will be fully charged; and when the electrolyte is weak, the battery is discharged.

(The next issue of RADIO WORLD will contain further information on storage batteries.)

Theater Assembly to Have Radio

The Theater Assembly spring luncheon will take place Saturday, April 29, at the Hotel Astor. The leading feature will be concert numbers by radio. The ballroom will be wired so the singers may be heard clearly by all of the 1,200 guests.

Expensive Sets

Radiotelephone transmitting sets, as a rule, are much more expensive than radiotelegraph equipment covering the same range, and require for their proper adjustment and operation the supervision of an experienced operator.

The Radio Primer

The A. B. C. of Radio for the Novice Who Wants His Facts Put Plainly and Tersely

Radio Definitions

B and C

BATTERY—A much abused word, being often used incorrectly for "cell." Careful distinction should be made between the two terms. A battery consists of two or more cells joined together so as to form a single unit.

BRUSH DISCHARGE — The brushlike appearance of luminous rays diverging from a pointed electrified body.

CONVERTER—A machine used to convert direct current to alternating or vice versa.

COUNTERPOISE—An artificial ground. A large amount of sheet metal or wire spread out and insulated from the ground.

COUPLING—A non-metal connection between two radio-circuits formed by two coils of wire. One may be placed inside the other or near it.

CODE—Combination of dots and dashes to form the letters of the alphabet.

CORE—The steel or soft iron center of an electro-magnet.

CONDENSER—(Variable) — A condenser with a variable condenser for storing up electric current.

CIRCUIT—A complete metal path for conveying an electric current.

CYCLE—Two complete alternations of an alternating current.

CRYSTAL DETECTOR—A device used to rectify the radio frequency currents to direct impulses which effect the diaphragm of the receiver.

CHOPPER—A motor driven interrupter used with C. W., transmitters.

"Radio Definitions" appears in each issue of RADIO WORLD. Save your copies, for this department will comprise a complete glossary of radio terms.

but—just one little loose wire makes the whole set absolutely useless for operation.

Troubles may occur most anywhere in the set; but the proper thing to do is to test the complete set: that is to say, each unit should be tested individually. Fig. 1 shows one method which may be applied to test with. Insert in series with the coil to be tested, a buzzer and two dry cells. If the coil is not broken the buzzer will buzz; but if no buzz is heard, it is certain that there is a broken connection somewhere on the coil. Inspect the coil very carefully and, no doubt, you will locate your connection. If the coil is tapped and a switch arm with contacts are used, the method is the same. Testing condensers is somewhat dif-

buzz is heard, then somewhere a short circuit is taking place, and the tester will have to examine it very closely again. As he turns, particular attention should be given in order to locate where the plates touch. If the short is found, the plate should be opened so as not to touch another plate. When no buzz is heard, the condenser is O.K. Fig. 2 illustrates the testing of the condenser.

How to Tell Good from Bad Galena

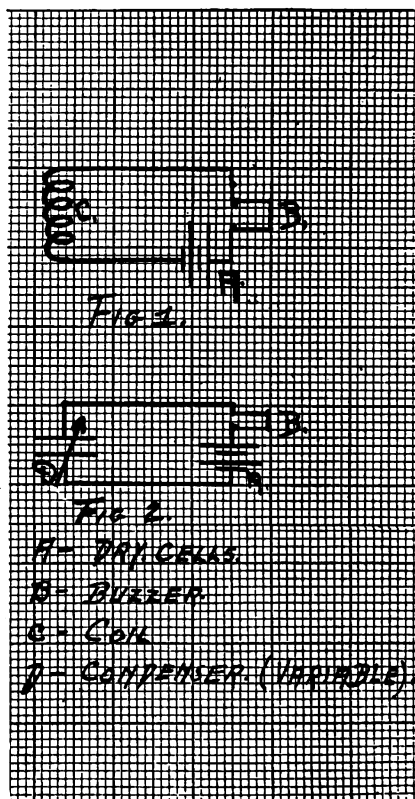
The crystal is the very heart of a radio set, and on it depends the whole workings of a set. There are many minerals that may be used for the crystal; but up to the present time, galena is the best that can be obtained. Galena comes in many different grades, and it is impossible to tell the good from the bad quality. The best way to tell is to buy several large chunks and break them up with a hammer. Experiment with the pieces until a good piece is found. Do not handle the mineral any more than possible as a coating of oil forms on the crystal which will cause insulating qualities. This will cut down the sensitiveness of the crystal and may render it entirely inoperative.

Lighting the Vacuum Tube by Storage Battery

A frequent question is: What is the proper source of supply for lighting vacuum tubes? It is almost needless to say that we advise the use of a good storage battery. The average vacuum tube draws about one ampere per hour with a given voltage of approximately six volts, and with a strain of one ampere on it, dry cells would last only a short time, when they soon would have to be replaced again.

The storage battery on the other hand has a much longer life and when it becomes low can be easily charged up.

It is well to remember that storage batteries are rated by the number of volts they will give and the number of amperes they will deliver. You will find that there are many different kinds of ratings on storage batteries



Diagrams showing instruments for test trouble as described in the accompanying article.

Testing Trouble in Receiving Sets

With the increased amount of amateurs making their own sets, one of the worst drawbacks the amateur faces is the proper connection of a set. In many cases, when a set has been finished and is set up it is found that the receiver fails to work. Every little connection may appear to be intact

ferent. Connect the condenser in series with the battery in the same manner as before, connect one side of the circuit to the movable set of plates, and the other side to the fixed set of plates. Continue now to turn the condenser, bringing the movable plates inside the fixed plates. If any

Tufts College Has First Radio Faculty



(c. Underwood & Underwood.)

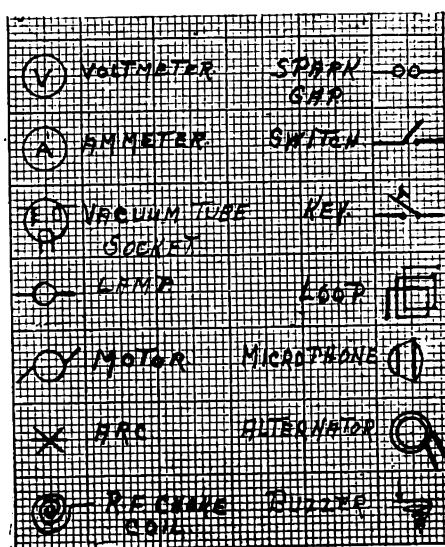
The first wireless college in the world! Th's distinction is claimed by Tufts College, Massachusetts. Thirteen members of the faculty have volunteered to give lectures on their subjects through radio at the American Radio and Research Corporation plant. The lectures will reach as far west as Wisconsin and as far south as Florida. In the photograph (reading from right to left) are Dr. Arthur I. Andrews, who will speak on "Changes In Europe;" Professor Edward H. Rockwell, "The Story of the Bridge Builder;" Dean Gardner C. Anthony, "The Story of Engineering," and Professor Albert H. Gilmer, "The Modern Drama."

(Continued from preceding page)

running from twenty ampere hours upward. The desirable thing is to have this rating as high as possible.

The battery will deliver one or more amperes for so many hours, depending, of course, upon the rating of the battery. Hence, the saying "eighty ampere hours," means it will deliver one ampere for eighty hours, or two amperes for forty hours and so on. If more than one vacuum tube is employed, the current drawn could be in proportion to the number of vacuum tubes used. As you will never use the battery for the full forty or eighty hours continuously, it will have a tendency to recuperate during the time it is not in use. Of course, it will never come back to full capacity but will rise slightly. Never let the battery get fully discharged or even low, as this is bad for it and in time will ruin it entirely.

More Radio Symbols Shown at a Glance



“Wired Wireless”

Major-General George O. Squier, U. S. A., announces an invention which will make it possible to attach the usual receiving set to an electric-lamp socket, by which the programs sent out from broadcasting stations may be received. This will eliminate the ordinary antenna. General Squiers gave the first demonstration of his new appliance at the Signal Corps headquarters, Washington, D. C., this week. It has already been christened "Wired Wireless." The general simply removed the bulb from the electric light on his desk, and inserting the plug of the receiver, completed the installation. The broadcasting station was connected at another point to the electric-lighting circuit. If this invention does all that is claimed, it will put the aerials in the discard and relieve congestion in the air.

Radio to Catch What Congress Says

By Vincent M. Brennan

U. S. Representative from Michigan

IN introducing the resolution to equip the Capitol with a Radio Telephone, one of the purposes I had in mind was to place this new and most promising method of communication under the actual and close observation of Congress. Already a number of bills have been introduced looking to the development and control of radio communication. Soon Congress will be asked to set upon the recommendations of the Radio Conference recently in session at the Department of Commerce. Congress, I believe, is alive to the amazing developments of this science within the past few months. But few of the members have had an opportunity of observing at first hand the working of the apparatus or of coming into actual contact with the practical problems of transmission which they will soon be asked to legislate upon. Actual observation of the apparatus in practice and personal use of it will make it possible for Congress to study the problems presented with intelligence and to base its legislation on personal and practical knowledge.

Furthermore, the development of the art today is the result chiefly of the experiments and study of amateurs. The amateurs are entitled to the encouragement and help which will necessarily follow from the official recognition and use of the apparatus by the national legislative body. As the limitations and defects of the present devices are disclosed, Congress will readily appreciate the necessity for adequate appropriations to enable the scientific departments of the government to study and, if possible, to overcome the difficulties presented.

A permanent and beneficial result of this application of the radio will be re-awakening of public interest in the doings of Congress. It is generally conceded that Congress would function better if the public took a keener interest in its proceedings. Few people nowadays have the time or the inclination to wade through the daily issues of the Congressional Record. Many, however, would be glad to keep informed if the activities of Congress could be presented to them in the attractive form of actual reproduction. Again it would encourage the youth of the country to keep in touch with the activities of the government. It is the young people who are making most general



Congressman Brennan, of Michigan, who has introduced a bill to have the Capitol equipped with radio, so that every word our law makers utter may be correctly recorded and sent broadcast to their constituents.

use of the radio now. Many of them are already writing to Congress asking for fair legislation upon this subject. I believe that many who now find the study of government uninteresting when confined to the pages of a text book would welcome the opportunity of pursuing the same study first hand from their own receiving instrument and at the same time gain some practical knowledge of forensic debate.

National legislation each year is becoming of more and more importance to the American people. Many business houses find it desirable to be informed the moment an important bill is passed or a vote is taken. The action of Congress, and particularly the time when it is taken, frequently affects investments involving millions. The time when a tariff bill goes into effect is of vital interest to a ship at sea bringing imports to the country. The time when a bill restricting immigration goes into effect is of equal interest to the trans-Atlantic liner carrying immigrants to our shores.

Complaint is frequently made that the Congressional Record does not accurately record the proceedings of Congress. Each member is permitted to correct his remarks and frequently to extend them. If a radio telephone is installed in the legislative halls, constituents will be able to learn ac-

curately what is said by their representatives on the floor.

While it is true that much of the debate upon the floors of Congress is not of great public interest, it is also true that frequently addresses of the greatest national importance are made. Now that the President has resumed the custom of delivering his addresses to Congress in person, it would be possible for the people also to hear these history-making messages. Many of our people would like to have the opportunity of hearing debates on the all important topics of disarmament, taxation, etc. Many of them are now denied this opportunity because of inability personally to visit Washington. The possibilities are almost limitless.

For instance, individual members might find it desirable to install receiving apparatus in their own offices. Visitors to the Congressional galleries often express amazement when they find only thirty or forty out of the four hundred thirty-five members of Congress in attendance on the floor. It is almost invariably true that perhaps three hundred and fifty of the missing four hundred are busily engaged upon official business in their offices or in the departments. The correspondence of Congressmen has been increasing year by year, particularly since the war, and since the public has come to recognize the value of propaganda in urging or opposing legislation. Frequently a member is not able to leave his office during an entire day, being kept busy dictating, receiving constituents, or telephoning departments. At intervals he calls the Capitol and is given a general idea of what is going on but often he misses a debate which he was desirous of hearing or participating in. With a radio receiver in his office he would have the means of keeping in constant touch with the proceedings on the floor. He could at all times be in a position to judge for himself whether the debate of the moment required his presence.

It is even conceivable that, in time, the various Government Departments would install receiving instruments. When a member of Congress would find himself obliged to wait for an hour or more in the outer office of a cabinet member, he could improve his time by "listening in" on the proceedings in the Capitol.

(Continued on next page)

He Pilots Ships Through Fog by Radio



(c. International.)

Commander Reilly F. McConnell at his post aboard the U. S. destroyer "Semmes," operating a new and important radio invention—a piloting cable which enables vessels entering New York harbor to proceed up Ambrose Channel to Quarantine through fog of any density, so that no time will be lost. Heretofore trans-Atlantic steamers entering New York have been held up for hours—frequently days—by fog. Today, aided by radio, no time is lost; a distinct advantage to mails and passengers.

Equipping both Senate and House sides of the Capitol with transmitters would further make it possible for Senators to keep in close touch with the doings of the House and

members of the lower house with the proceedings of the Senate.

The uses and applications of a Capitol Radio would be equally valuable and varied. It would seem that

Congress should lose no time in establishing this most promising innovation.

Here is the complete text of Congressman Brennan's bill:

IN THE HOUSE OF REPRESENTATIVES

FEBRUARY 27, 1922.

MR. BRENNAN introduced the following joint resolution; which was referred to the Committee on the Merchant Marine and Fisheries and ordered to be printed.

JOINT RESOLUTION

Providing for the installation and operation of radio-telephone transmitting apparatus for the purpose of transmitting the proceedings and debates of the Senate and the House of Representatives, and for other purposes.

Resolved by the Senate and House of Representatives of the United States of America in Congress assembled, That the Secretary of the Navy be, and he hereby is, authorized and directed to have installed, from stock now on hand in the Navy Department or available, and to maintain radio-telephone transmitting apparatus in the Capitol Building, Washington, or at the naval radio station, Radio, Virginia, with connection to the Capitol

Building, and suitable for transmitting for the greatest practicable distance the proceedings and debates of the Senate and House of Representatives. The Secretary of the Navy is further authorized and directed to furnish sufficient personnel from the Navy Department to operate such apparatus for the purposes herein mentioned.

Sec. 2. That such apparatus, when installed, shall be used to transmit the entire proceedings and debates of the Senate and of the House of Representatives in so far as may be practicable. When the Senate is not in actual session the President of the Senate shall have authority to designate any committee of the Senate to have the use of such apparatus in transmitting its hearings and proceedings, and the Speaker of the House of Representatives shall have corresponding authority with reference to committees of the House of Representatives.

Sec. 3. That such amount as may be necessary for the above purpose is hereby appropriated out of any money in the Treasury not otherwise appropriated.

Receiving Circuits of European Amateurs

The object of this paper is to give a brief summary of just what our European amateur friends are accomplishing in receiving circuits. American fans would do well to study some of these circuits and try them out. Of course, this is preferably for radiophone reception.

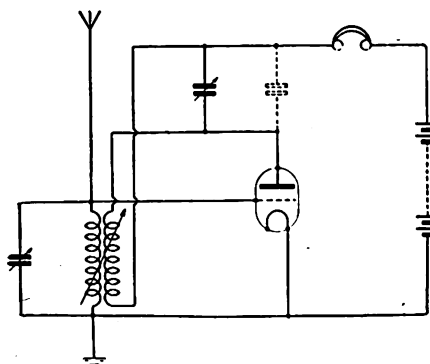


Fig. 1.—A circuit found available for the best all-around results.

The question is often asked: "What is the best circuit for good results, or why is one circuit better than some other particular circuit?" Well, practically any circuit you sit down to draw out may seem advisable, and may work out, that is to say, work within reason and under favorable conditions. But the question is whether it works efficiently. To be more exact, would it work efficiently on the particular wave length you wish to receive on, or for that particular purpose you most desire. Different circuits give different results, so we have for the amateur three circuits sketched herewith.

Fig. 1 is a circuit which was found adaptable to give the best all-around results. It readily oscillates on any wave length between 400 and 20,000 meters, but is simple to adjust and to keep in adjustment. It is equally

good for undamped as well as damped waves. Its only disadvantage lies in the fact that it will not readily rectify on short waves.

Fig. 2 shows a much simpler set, using a resistance capacity coupling. This two-audion circuit was found most successful. Values are given as follows: C1 equals .0001 Microfarad, anode resistance 85000 ohms, C2 equals .0004 Microfarads. (preferably variable). and B Battery from 25 to 45 volts. The points of interest in this circuit are that the resistance should be small, have as little capacity to earth and to other instruments as possible. The same remarks apply to C2, since C1, is only necessary for short wave work. This circuit is particularly suitable for telephony reception, as it is quite easy to get just off of the oscillation point, and with tight coupling it read-

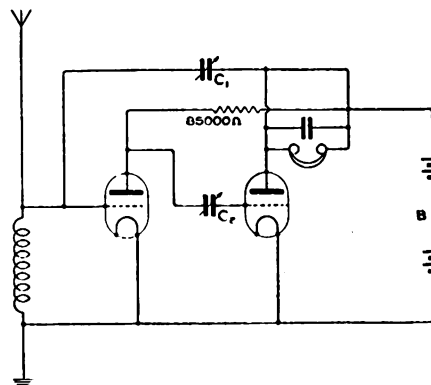


Fig. 2.—A simpler set with a resistance-capacity coupling.

ily "howls," which is not conducive to the long life of the tubes, and gives very serious annoyance to your wireless neighbors.

Fig. 3 is a development of Fig. 2, but by experience gives somewhat better results. A critical point will

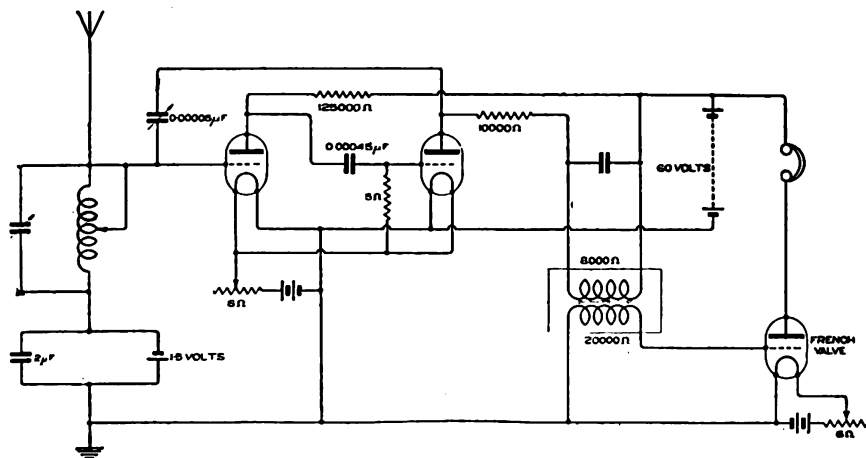


Fig. 3.—A development of Fig. 2, which gives much better results.

be found just off the tube when it does not oscillate, but with the arrival of a C. W. signal starts it off. A spark signal will not start it oscillating, unless it is good and strong. However, in using this circuit with a two step amplifier and loud speaker, signals are very strong.

High-Grade Apparatus for Amateurs

The various makes of high-grade, reasonably priced, radio apparatus now on the market make it unnecessary for the amateur to construct any of his own instruments, and enable even the inexperienced operator to obtain good results. The requirements in the design and construction of an efficient radiophone receiving set are more rigid than those for a receiver to be used merely for spark reception, on account of the sharp tuning required for telephone signals, as well as the desirability of regeneration. The experienced amateur who so desires, however, may construct some of the apparatus himself, and thus not only effect a saving in cost, but also incorporate in the apparatus his own ideas and preferences. Instructions for the construction of various radio instruments may be found in the various radio books and periodicals.

For those who prefer to assemble their own sets from standard parts, the instructions and diagrams contained in the catalogs of several manufacturers and dealers of radio instruments will prove valuable.

Locating Signals

This is accomplished by careful variation of the tuning while using an excessive value of tickler coupling or plate inductance, i. e., just within the "hissing" region. Continuous wave telegraph signals will now be heard, and phone signals can be recognized by the steady, whistle-like beat note which their carrier wave produces. To "clear up" the voice or music, the tuning should be maintained to give the beat note of lowest pitch, while the regeneration is gradually decreased until the beat note just fades out, and the radiophone signals alone remain. Distortion or whistling at this point is usually eliminated by a very careful further reduction in regeneration, with a slight readjustment of the tuning circuit for maximum signal intensity. The tuning of distant radio telephone signals is critical, and will be learned by the beginner only after some practice.

Licensed Broadcasting Stations

RADIO WORLD has secured a list of all stations throughout the country licensed by the United States Government to broadcast music, news, market reports and all other matter. All of these stations operate on either a 360-meter wave or a 485-meter wave. In order to tune into any of these stations, only slight variations are necessary.

Atlantic

Call Letters	Station	State	Operated by
WJZ	Newark	N. J.	Westinghouse Co.
WNO	Jersey City	N. J.	Wireless Telephone Co.
WOR	Newark	N. J.	L. Bamberger & Co.
WJX	New York	N. Y.	De Forest Radio Co.
WDT	New York	N. Y.	Ship Owners Radio Service
WVP	Fort Wood	N. Y.	U. S. (Amateur Radio Reserve)
WCJ	New Haven	Conn.	A. C. Gilbert Co.
WBZ	Springfield	Mass.	Westinghouse Co.
WGI	Medford Hillside	Mass.	American Radio Research Co.
WDN	Washington	D. C.	Church of the Covenant
WDW	Washington	D. C.	Radio Construction Co.
WJH	Washington	D. C.	White & Boyer Co.
NOF	Washington	D. C.	U. S. Public Health Service
WRW	Tarrytown	N. Y.	Tarrytown Radio Research Laboratory
4CD	Atlanta	Ga.	Carter Electric Co.

Middle West

KDKA	Pittsburgh	Pa.	Westinghouse Co.
WPB	Pittsburgh	Pa.	Newspaper Printing Co.
WLK	Indianapolis	Ind.	Hamilton Manufacturing Co.
WDZ	Toledo	Ohio	Marshall Gerken Co.
WMH	Cincinnati	Ohio	Precision Equipment Co.
WBL	Detroit	Mich.	Detroit News
KYW	Chicago	Ill.	Westinghouse Co.
WHA	Madison	Wis.	University of Wisconsin
WOU	Omaha	Neb.	R. B. Howell
WLB	Minneapolis	Minn.	University of Minnesota
9ZAB	Kansas City	Mo.	Western Radio Co.
9YY	Lincoln	Neb.	State University

Pacific

9ZAF	Denver	Col.	Reynolds Radio Co.
KLB	Los Altos	Calif.	Colin B. Kennedy Co.
KLB.	Pasadena	Calif.	J. J. Dunn & Co.
KQL	Los Angeles	Calif.	Arno A. Kinge
KZC	Los Angeles	Calif.	Leo J. Meyberg Co.
KZC	Los Angeles	Calif.	Western Radio Electric Co.
KGC	Hollywood	Calif.	Electric Lighting Co.
KZM	Oakland	Calif.	Preston D. Allen
KZY	Oakland	Calif.	Atlantic & Pacific Radio Sup.
KVO	Sacramento	Calif.	J. C. Hobrecht
KDN	San Francisco	Calif.	Leo J. Meyberg Co.
KGB	San Francisco	Calif.	Edwin L. Lorden
KYY	San Francisco	Calif.	Radio Telephone Shop
KQW	San Jose	Calif.	Charles D. Herrold
KJO	Stockton	Calif.	C. O. Gould
KWG	Stockton	Calif.	Portable Wireless Tel. Co.
KJJ	Sunnyvale	Calif.	The Radio Shop
KFC	Seattle	Wash.	Northern Radio Electric Co.

Gulf

WRR	Dallas	Tex.	Police Department
5ZU	Austin	Tex.	State University

The First Broadcaster

RADIO telephone broadcasting station KDKA of the Westinghouse Electric & Manufacturing Company at East Pittsburgh, Pennsylvania, occupies the unique position of being the first broadcasting station in the world operated entirely for the transmitting of radio concerts and features for the public. This station, which started December 23, 1920 to broadcast regularly, during its term of operation, has created a speaking acquaintance, literally, with more people than any other radio station. Practically none of its friends had a radio receiver in their homes until 1921.

Since its creation, the radio telephone has grown from the baby of the amateur to a giant entering thousands of homes. When Westinghouse started broadcasting from East Pittsburgh, its concerts were heard by a comparatively small circle, the reason being that only a few amateurs had receiving stations, the greater number being boys without a sending license. A few antennas had been strung on roof tops by boys interested in radio.

To-day any traveler looking out of his car window as he enters the Pittsburgh district can see the progress of radio. There is hardly a housetop in the suburban districts that does not

have its antenna on the roof. Even in the downtown section the familiar wires may be seen.

When KDKA was started, a few letters were received daily telling of the concerts. The volume of letters gradually grew larger until, one day in January of this year, some 1,600 letters were received. These letters were from points all over the United States, Canada, and even Cuba.

KDKA, being the pioneer station of its kind, had to experiment quite a bit at first. For some time, phonograph records were used exclusively for music. There was also an announcer who spoke into the transmitter, telling of local news and weather reports. This lasted for a month when it was decided that real singers should be substituted. The radio division had to offer original entertainment after the amateur's first flush of rapture had worn off, to hold him.

KDKA was the first station in the world to broadcast church services. It was also the first to broadcast the speeches of public men, sporting events, and grand opera.

Useful Tables

To find the natural period of any wave length, in meters, of an aerial the following formulae may be applied:

$$W = \frac{L \times 4.2}{3}$$

WL=Wave length in meters or natural period of an antenna.

L=Length of aerial wire, plus lead in wire and ground wire, in feet.

The following formulae may be used in finding the capacity of a condenser:

$$C = \frac{A \times K}{4 \times 3.1416 \times T \times 900,000}$$

C=Capacity in microfarads.

A=Area in square centimeters of surface of plates.

K=Dielectric constant or specific inductive capacity of the dielectric used.

T=Thickness of dielectric used between plates.

From Nebraska

Editor Radio World,
Dear Sir:

Our daily schedule for broadcasting is at 10:10 a. m. The report consists of line stock and grain markets and a weather forecast.

Our musical programs have been irregular and so we do not publish a program.

Yours truly,

(Signed) H. V. Hein
For the University of Nebraska

Wireless Telephone to Link Hotel Chain



(c. International.)

Here is the station on the roof of the new Ritz-Carlton Hotel, Atlantic City, New Jersey, where a radio telephone has been installed which will make it comparatively easy for the guests of this hostelry to talk with the guests of any other Ritz-Carlton hotel in the world. This photograph shows the interior of the station and the operator awaiting a message.

Do You Know Your Receiving Equipment?

What Each Part Stands for—and Why

By James D. Gordon

The Antenna

Many types of antenna are in general use. The particular type of antenna used, and its exact location, will in general be determined by the local conditions, such as dimensions of the property, location of convenient high supports, avoidance of interfering trees, etc. Where an equal choice between several antenna locations exists, and it is desired to make use of the slight directional characteristics of the average inverted "L" type of antenna, the free end of the antenna should point away from the station which is to be received most efficiently.

A good form of receiving antenna for general radiophone reception consists of a single wire, 100 to 250 feet long, and 30 feet or more above the ground. The antenna should be as far as possible from all surrounding objects, and not run parallel to nearby electric wires. In general, the more free the antenna is, i. e., the higher it is above surrounding objects, the better it will receive. Great height, however, is not essential, and satisfactory reception has been accomplished even on wires strung inside

the attic of small dwellings. Where it is preferred to make the antenna less than 100 feet in length, it should consist of two or more parallel wires, held apart by wooden spreader at each end. The usual conductor for an antenna consists of 7 strand No. 22 hard drawn copper wire, or of No. 14 bare hard drawn copper. Where a great safety factor of strength is desirable, as in commercial installations, or where a long span is used, or the antenna crosses power lines, it is better to employ 7 strand No. 22 or No. 18 Phosphor Bronze or Silicon Bronze wire.

Each end of the antenna should be insulated from its support by means of an insulator of electrose, porcelain, glass, or other material. Small insulators, having a creepage path of several inches, will suffice for receiving purposes. The insulator is preferably attached to its support by means of a few feet of rope or sash cord; if a wire is used, a second small insulator is best inserted near the other end of this wire, so as to separate effectively the antenna from the grounded portion of the wire.

A pulley at one or both ends of the

antenna will be found convenient for raising or lowering this part of the equipment when desired.

In the case of the single-wire antenna, one end of the antenna is usually continued straight down from the insulator to form the "Lead-in," which connects the antenna with the instruments. Where a multiple-wire antenna is employed, a separate lead-in wire should be attached at, or near, the end of each antenna wire. These lead-in wires may be bunched together a short way down from the antenna, or may all remain separate until they reach the point where they enter the building.

All electrical connections in the antenna, as well as in the ground system, should be soldered to avoid poor contacts due to corrosion.

The lead-in is led into the building through a lead-in bushing or insulator. This may consist of a special electrose insulator, or of an ordinary porcelain tube, as used in house wiring. Inside the house, the wiring should be as short and direct as possible, and not near other wires, piping, girders, etc. To avoid electrical losses, it is best to locate the appara-

tus' within a few feet of where the lead-in enters the house.

Where conditions prevent the erection of an outdoor type antenna, good results are often achieved with antenna wires strung inside the building, preferably in the attic. Where a long span is not available, an increased number of wires should be used (six, eight, or more). These wires should be kept away from and not run parallel to nearby electric light wiring, piping, or other grounded metallic objects. In the case of indoor antenna dry wood will generally give sufficient insulation.

In some cases, where the installation is of a temporary nature, it is even found possible to use the eaves-through or gutter-pipe for the reception of signals.

Indoor coils or loop-antennae are generally not found practicable unless used with many stages of amplification.

Ground Connection

A sufficient ground connection is generally afforded by the water supply system. Where a steam or hot water pipe is more convenient, it may be found to give satisfactory results.

The wiring from the tuner to the ground connection should be no longer than necessary. For short leads the wire should not be smaller than No. 18; a larger size wire is preferable, especially for connections exceeding a few yards in length.

To insure good electrical contact with the ground system, both the pipe and the wire connecting to it should be well scraped, and the connection preferably soldered.

The Tuner

The function of the TUNER is to permit the signals from the desired station to be received to the best advantage, i. e., to be "tuned in," while all other signals are kept out in so far as possible. The electric impulses received are then converted into currents suitable to actuate the diaphragms of the head receivers, by means of the DETECTOR. If desired, increased signal intensity is obtained by insertion of an AMPLIFIER between the detector and the 'phones.

The Detector

Until recently, the crystal or mineral detector was in quite general use in radio reception. This simple type of detector consists of a metallic contact ("point" or "catwhisker"), resting lightly upon a small piece of galena (lead ore), silicon, or carborundum. When this type of detector is employed, a test buzzer circuit with dry cell is essential to show when the detector contact is in the proper sensitive adjustment.

Where the facilities permit, more

sensitive detectors of the electron tube type now employed. ("Vacuum tube" or "Audion" detectors.) This type of detector consists of an incandescent electric bulb, which requires a source of filament current, called the "A" battery, usually a six volt storage battery. A "B" battery is also required to furnish the plate potential; this usually consists of a number of small dry cells, assembled in a unit. Either a gas-content tube ("soft" tube), or a highly evacuated tube ("hard" tube), may be used for detection purposes. The gas-content detector tubes are generally more sensitive, but require delicate adjustment of plate battery voltage and filament current for proper operation, while the less sensitive "hard" tubes are non-critical in their adjustments, and, therefore, are preferred by many operators.

While storage batteries have been found to be the most satisfactory source for lighting the filaments of the common electron receiving tubes, they necessarily require charging facilities. Most electron tubes used for reception require a filament current of approximately one ampere; hence a six volt, 60 ampere-hour storage battery, for example, supplying filament current for a detector and two-stage amplifier, would require a complete charge after every twenty hours of operation, or oftener.

For intermittent operation of elec-

tron tube detectors, large size (No. 6) dry cells have been employed. It is very desirable, however, in such cases to employ two or three sections in parallel for each bulb used, each section in turn consisting of four cells connected in series. Thus the operation of a single-tube receiver would take eight or twelve dry cells, preferably of a type designed especially for lighting service.

The Westinghouse Co. has recently placed on the market a simple, portable receiving set which utilizes a small detector tube of special design, the filament of which is supplied from a self-contained dry battery.

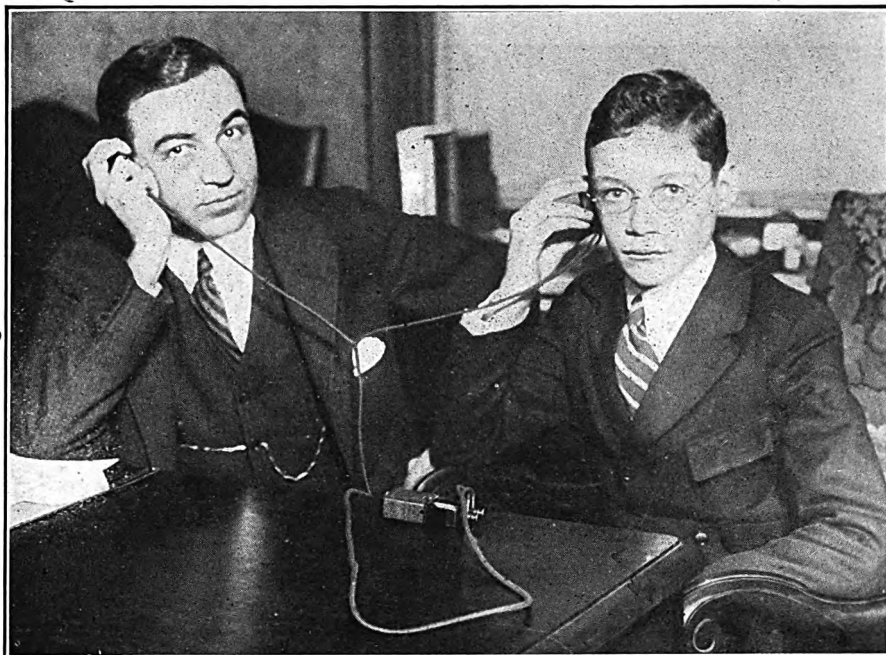
Where the utmost sensitivity is desired, it has been found possible to amplify the received impulses BEFORE they reach the detector, by means of special RADIO AMPLIFIERS. The use of radio frequency amplifiers for short wave reception is still in the development stage, however, and cannot at the present time be recommended to beginners.

The tuner and the detector, combined, are generally spoken of as the receiver, although sometimes this term is used to include the amplifier also, and again is sometimes used to denote the tuner only.

The tuner contains one or more electric circuits which are adjusted to respond to oscillations of the desired wave length only. The simplest form

(Continued on next page)

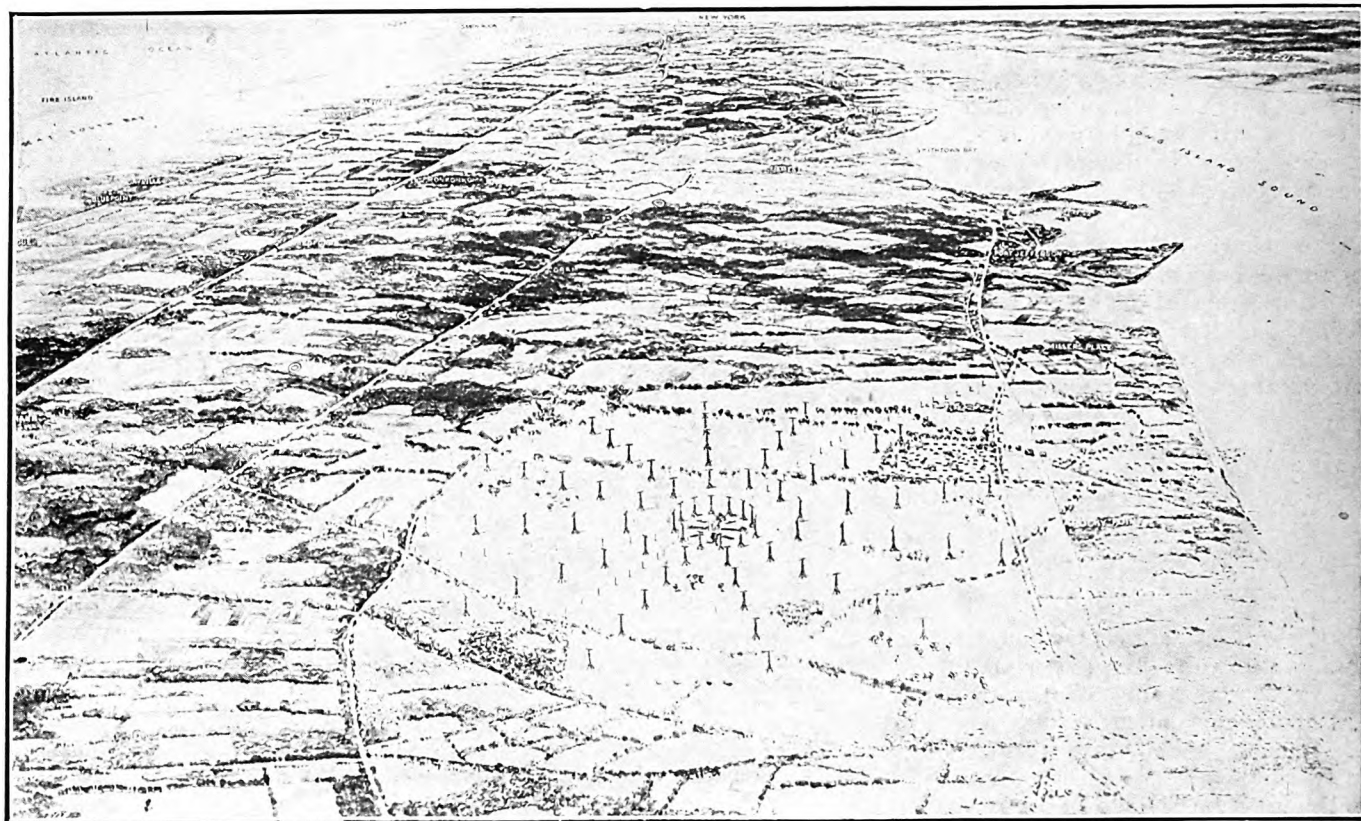
Smallest Radio Outfit Known



(c. Underwood & Underwood.)

A youthful genius, Kenneth R. Hinman, twelve years old, has invented a wireless apparatus that fits neatly into a safety match box. With this instrument, and pair of ordinary receivers, the juvenile inventor is able to catch not only telegraph signals but the regular broadcasting programs from stations twenty and thirty miles distant. This shows Kenneth Hinman and Mayor Charles E. Loizeau, of Plainfield, New Jersey.

Hub of World-Wide Communicatoin



(c. Underwood & Underwood.)

The first unit of the largest radio station in the world is well under way at Port Jefferson, Long Island, New York, the plant of the Radio Corporation of America, will be ready for operation about the first week in September. Twelve steel towers, each 400 feet high, comprise the first unit of the station which will have the appearance of a giant wheel when completed. The circumference formed by the twelve towers will be about three miles. This new station, it is now declared, will be the future hub of International radio communication. It will be equipped with the Alexanderson high-frequency alternators, the machines which have made wireless across the oceans possible. Port Jefferson was selected for the station because its situation, near Oyster Bay, is particularly attractive. It is close to Long Island Sound on a high stretch of unobstructed ground-level and open. No other spot on the Atlantic Coast affords so perfect a position. It is a busy bustling place; skilled workmen toiling throughout the bright spring days to get the big station in working condition. Here messages will come from the faraway plateaus of the Andes, from the sunny isles of Hawaii, from the busy marts of Europe. The radio enthusiasts who have played, eaten, and talked radio for the past fifteen years—men, not so long ago boys, who have seen Marconi's crude 10-inch spark coil and the unreliable coherer grow into the highly effective present-day vacuum tube, transmitter and receiver, point with the keenest pride to the gigantic creation now under way at Port Jefferson.

(Continued from preceding page)

of tuner consists of a cylindrical coil of wire, with one or more sliding contacts.

There are two general classes of tuners in use, the single-circuit and the multi-circuit tuners. The single-circuit tuners are the more easily operated, and generally less expensive. The multi-circuit tuners are preferred by many experienced operators, since they give increased selectivity (freedom from interference), but their operation considerably more skill and experience. So-called REGENERATIVE TUNERS, of either the single-circuit or the multi-circuit type, have an additional feed-back adjustment, for use in connection with electron tube detectors.

Head Receivers

Telephone receivers used for receiving radiotelephone messages are essentially the same as the standard

telephone receiver with which everyone is familiar, the distinctive features being their form and construction. They are usually constructed in the watch case form and attached to bands which pass over the head. From this comes the name—head receivers. In construction the parts are lighter and many more turns of wire are wound around the magnetic poles. The lightness of the moving parts enables them to follow and respond to rapid pulsations of current. The large number of turns of wire causes a relatively large magnetic field to be produced by a feeble current. The combined effect gives a very sensitive receiving device. Inasmuch as the size of wire used is always about the same, the number of turns is usually designated indirectly by stating the coils. Comparatively high resistance number of ohms resistance of the is desirable and receivers of fair sen-

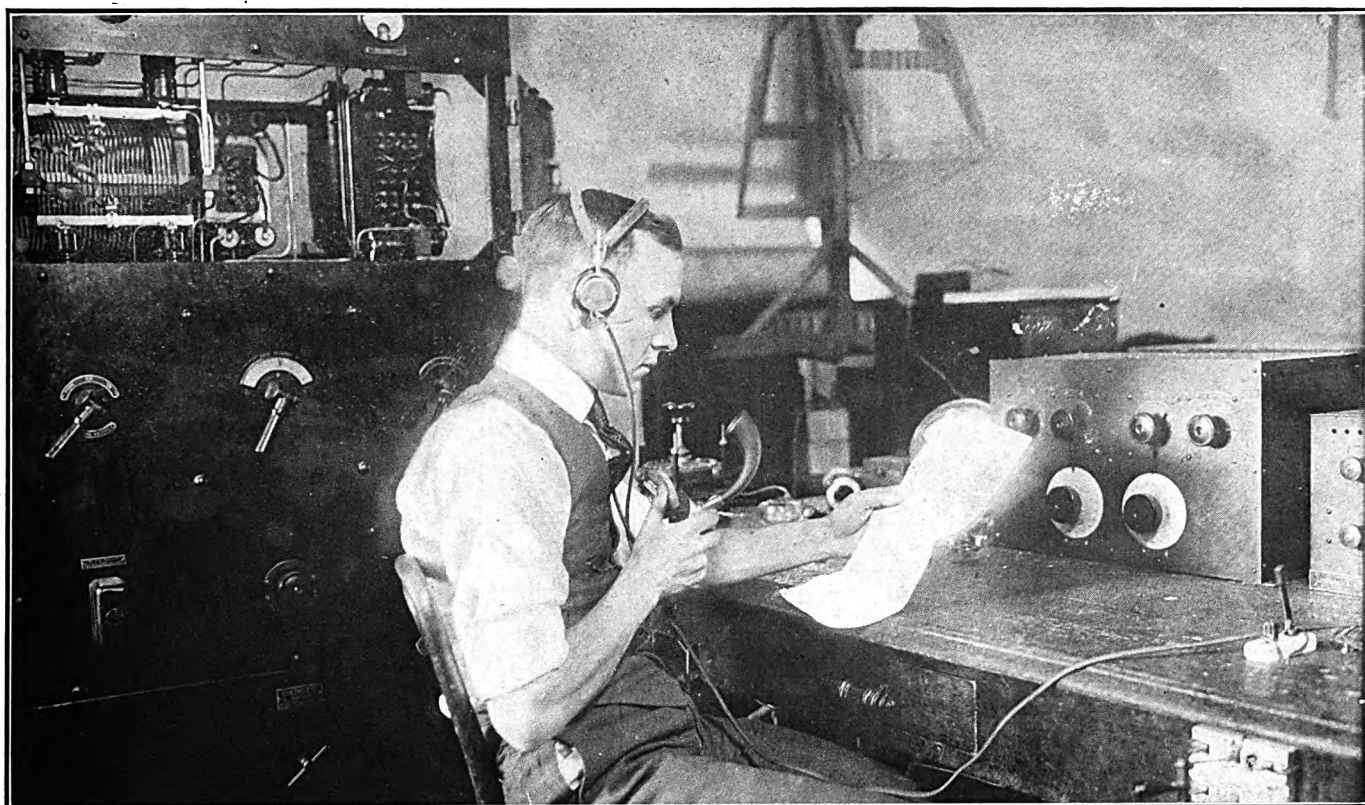
sitiveness have 1,000 ohms in each receiver while the better ones usually have 1,500 to 2,000 ohms per receiver. The two receivers are usually connected in series.

Amplifiers

The strength of the signals received and hence the range to which the receiving set will pick up signals, may be further increased by the use of one or more stages of amplification, each of which requires an additional electron tube circuit. The amplifier tube filaments may be operated from the same "A" battery as is the detector tube filament. Likewise, a common "B" battery may be employed for detector and amplifiers if proper connections are made.

Generally, not more than two stages of audio frequency amplification are employed, except where exceptional signal intensity is required, as for operation of large loud "speakers."

Fans! Get Acquainted With This Man



(c. Underwood & Underwood.)

Here is one of the most important men in the radio service. He is T. C. Gale, and he is shown here in his corner in the Post Office Department, Washington, D. C., broadcasting weather and crop reports. The messages he sends out are entrusted to him for exact delivery by the most important departments of the government. It is up to him not to make a mistake. Mr. Gale talks to one of the largest audiences in the world.

Why a Crystal is Called a Rectifier

How It Acts To Make Undamped Radio Currents Audible

By Walter Emmett

The crystal cuts out every alternate half vibration and enables the telephone to respond to even the radio frequency for 200 meters. This is 1,500,000 cycles or double vibrations per second. The other extreme in radio frequency is found at the present time in Lafayette (Ly) at Bordeaux France which send out a wave which has only 13,630 double vibrations per second. There are many persons who can hear acoustic vibrations of this frequency and for them this 22,100 meter wave could be amplified at the receiver and put into specially designed phones with a very small thin diaphragm and received *directly without any crystal or other "rectifier" such as the audion being used at all!*

It is thus evident that we generally need two things to happen to the radio frequency currents before they get to the phones.

1st.—They must be allowed to

move the diaphragm of the telephone.

2nd.—They must move it at audible frequencies—below, say 4,000 cycles per second which is the top note on a piano.

The passage of a very small current of 4,000 cycles or less will vibrate the telephone diaphragm. The passage of a current of 20,000 cycles will scarcely affect it since the telephone windings offer a great impedance to such currents, the more rapidly they change their direction. When we come to 750,000 cycles, approximately, as found in broadcasting waves. The telephone would give no sign at all; the diaphragm can not follow the current in the phones fast enough as its natural period is only about 900 cycles per second, and the current is cut down.

The crystal causes all currents in the phones to *pulse in one direction only* giving a practically steady pull in one direction to the telephone dia-

phragm. If this pull is interrupted by the cutting off of the sending wave, by the form or telegraphic dots and dashes we have a corresponding series of clicks on the phone, but this would not be satisfactory.

The transmitting telegraph current or received current must be interrupted at regular repeated intervals—or cyclically as it is termed—at a high enough rate to give an audible singing vibration to the phone diaphragm. This can be done by a chopper at the sending end giving 1,000 interruptions per second or a chopper called a "ticker" at the receiving end.

Difference of Location

Geological conditions and other factors not hitherto explained appear to have some influence on radio signals. Some locations appear to give better results for radio transmission and reception than others, without any obvious reason.

Radio and the Woman



(c. International.)

Miss Rosalind Kendall, of New York, in the midst of a chess game with her chum, Miss Beth Weber of Chicago.

A WOMAN friend remarked to me the other day that she expected to enjoy her vacation this year, because, instead of having to spend her evenings on some hotel piazza listening to a rehashed phonograph record or thumping on the piano, she can select, as her stopping-place, a hotel in which a radiophone has been installed and in this way get new stuff she wants to hear, and get it "right off the griddle," as she expressed it.

* * *

It must have proved to be an interesting event, that which took place at a noted physician's home on West Eighty-fifth Street, where, by means of radio telephone service, his friends gathered round and listened in on Dr. Stires's vesper service which was broadcast from the Westinghouse station. Some idea of a quiet hour, eh?

* * *

I passed a friend in the street. There was a dewy look about her eyes, and when I spoke she drew me aside a bit while she explained that she'd just received a letter from an invalid soldier, who, obliged to lie flat on his back and with only the use of head and hands left him, had been presented with a radiophone which someone had installed for him and which had brought him into touch with the world again. He'd felt he'd been away a long time, you see; he'd written that it was good to be back.

* * *

She's a very famous person; you'd recognize her name in an instant if I mentioned it. I met her on the street

quite by accident. She looks about seventeen, though her age is nearly twice that. A beautiful, elflike child held her hand.

We discussed the usual conventionalities until she asked if I'd heard how the child's life had been saved last year. I hadn't, so she told me about it. She was scheduled to sing one night at a broadcasting station in a distant city, and, quite unknown to her, the little girl had been taken suddenly ill. The mother had been travelling alone and none of the relatives at home knew just where to reach her. Fortunately, just an hour or so before the crisis was expected, a letter came

from her in which she mentioned the fact that she was singing that night and which instructed her folks how to get "in touch" so "baby can hear."

It happened to be the very thing that was needed. The child had been fretting for her dreadfully. When she heard her mother's voice over the radiophone and caught the familiar little love words—the fever quickly abated.

As my friend finished talking, the child laughed and looked up. Our glances met and said: "It's a blessed, lifegiving thing, isn't it!"

* * *

When I paused near the glove counter in the big department store, it never occurred to me that I was "listening in."

The attractive blonde girl there, was saying to the little dark-eyed one: "An if you'll go with us you'll get a swell automobile ride, and maybe a dance."

"Dark-eyes" answered negatively:

"Aw—who wants to dance when they've been on their feet all day. Come on and go home with me. We've got something at my boarding house that throws those joints in the shade!"

The blonde lady smiled disdainfully.

"My God! The front parlor of a boarding-house!"

"Dark-eyes" took note of her.

"Yer don't know what yer missin'" she said haughtily. "We've got a radiophone."

That was all I caught. A third saleswoman came up and spoke to me and helped me select some gloves. As



(c. International.)

The Chicago Board of Education, realizing that the commercial future of wireless is of such importance that it should become as much a part of the coming generation as any other accepted high school course, has inaugurated a department of radio. The photograph shows Miss Elizabeth A. Bergner, radio instructor at the Lane Technical High School, Chicago.

she went away to wrap them, I noticed the other two had their heads together. I had moved away but their voices floated across:

"And what time does it begin?" the blonde one asked.

"Six-thirty."

They looked at each other. The blonde girl shrugged.

"Gee! Those guys'll be sore," she said, "but me fer the boardin'-house!"

* * *

Miss Gladys Meyers, of Elizabeth, New Jersey, derives considerable pleasure from a radio ring. The ring, when attached to an ordinary parasol, as shown in the photograph reproduced on this page, with a wire dropping to earth to act as a ground, anything else in the form of wireless will receive messages, concerts, or conversation that happens to be in the air. The ring measures one inch in diameter, five-eighths of an inch in width, and seven-sixteenths in thickness. It is said to be the smallest radio-set in existence, and was made by Alfred G. Rinehart, nineteen years old, of Elizabeth.

* * *

If you have been playing your favorite game—be it chess or pinochle—with one person, continuously, it is something of a shock to be separated from that person and the game rudely broken up. Miss Beth Weber and Miss Rosalind Kendall of Chicago, were chess enthusiasts. Miss Kendall moved to New York, and the chess games were interrupted until she came across a big idea. She told her chum all about it and their radio chess-games began to be a regular weekly event. In the illustration on the opposite page, Miss Kendall is calling off her move and awaiting Miss Weber's response from Chicago.

* * *

That very sensible adage, "An ounce of prevention is worth a pound of cure" is being forcibly recalled in the five-minute health talks which the division of public-health education of the State Department of Health is broadcasting from WGY, the General Electric Company's station at Schenectady. What a boon to physician-fearing folks these talks will be!

* * *

I was an invited guest at a dinner party at the home of a friend. "Come early enough to watch the children as they listen to their bedtime stories," she had said. I marveled at the devoted mother who, while supervising a sumptuous dinner, would not, for that one evening, at least, omit the usual 'kiddie story,' but when I arrived and saw the three pairs of shining eyes that were turned attentively



(c. Underwood & Underwood.)

Miss Gladys Myers, Elizabeth, New Jersey, with the latest radio-receiving contrivance—a ring and a parasol.

to the loud-speaker horn connected with the wireless instrument just beneath the window, I understood how it was possible, and I'm sure, I enjoyed Mr. Cory's "Little Jack Rabbit in the Briar Patch" and "Uncle Lucky's Left Hind Foot" just as much as those blessed babies did.

** * *

Are the rhinestone pins, shaped and fashioned in the form of a brilliant flash, which we women are wearing in our headgear, forerunners of radio designs to come? It will be interesting to note the effect of wireless on the world's famous costumers.

* * *

Methinks that the great American novel which has been promised us for so long a time, has been awaiting just such a theme as radio. In the hands of an inspired author, think what a story could be written around the derelict who, unconsciously influenced by soul-stirring radio voices, has re-

gained a grip on his better self. And what a play a really great producer could make of this!

* * *

There is a certain woman I know, who is blind. Naturally, because of this great affliction, she has been forced to miss much that is worth while in life. Can't you imagine what a recently installed radiophone is going to mean to her!

* * *

One of the best things I have listened in on recently, was the program of Old English, French, Italian, and operatic arias sung by Luelia Melius, coloratura soprano. This singer's voice seems particularly suited to the radiophone.

* * *

You folks who possess old phonograph horns had better dispose of them before certain enterprising radiophone manufacturers begin making improved ones.

R. R. G.

Radio Merchandising

A Department of Service for Dealers
Selling Campaigns and Problems

Keep Your Hands Clean

It is natural that advertisers should use superlative terms in describing their goods—due more to their actual faith in the thing they are selling than to any desire to create a false impression.

The problem of merchandising in the radio business-field does not call for an exaggeration of any kind. Radio is, in all its aspects, so marvelous a thing that it does not require wild claims or the imaginative rambling depended upon so much by advertisers in other lines of business activities.

Radio advertisers have wonderful things to sell—so wonderful indeed are they, that clean-cut facts regarding them will carry the selling story straight into the understanding of the buyer.

The more closely radio advertisers hew to the line of truth, amply backed by the goods they have to sell, the quicker and surer and more satisfactory will be the results obtained.

To be sure, there is romance and mystery and science and art to be found in the radio development that have been startling the world in recent times. Therefore, the advertiser who, recognizing the fact that truth is not only stranger but greater than fiction, will serve his own purpose best if he will tell the world of the merits of his goods in a manner that arouses interest, makes an attack on the imagination but at the same time does not carry expectation beyond the line where conviction ends and incredulity begins.

The right goods first.

Then the advertising truth about them.

Then the sale.

Then satisfaction.

And—

A customer that sticks.

New Radio Incorporations

International Radio Corp., New York, apparatus, \$20,000,000. (United States Corporation Co.)

Peck Radio Corp., Brooklyn, \$7,500; G. B. Peck, W. E. Donavin. (Attorney, H. J. Defavin, 23 Flatbush Av., Brooklyn.)

Proctor Phonograph and Furniture Co., Yonkers, \$100,000; M. Connolly, J. and A. Gee.

Radio Industries, Inc., Manhattan, \$20,000; H. Gitlin, J. H. Faulker. (Attorney, J. M. Hergberg, 2 Rector St.)

Dependable Radio Corp., New York, wireless instruments, \$500,000. (U. S. Corporation Co.)

International Radio Corp. of N. Y., Man-

hattan, apparatus, \$20,000; R. K. Thistle, H. C. Hand, A. R. Myers. (Attorney, S. Ryan, Albany.)

Famous Victor Radiola, Manhattan, \$10,000; R. Finn, E. Ginsberg. (Attorney, A. L. Davis, 200 5th Av.)

Solar Radio Corp., Brooklyn, wireless telegraphy, \$10,000; H. Bijur, H. H. Hertz, A. Lembark. (Attorneys, Bijur & Hertz, 29 Broadway.)

Union Radio Corp., Manhattan, make radio apparatus, 1,000 shares preferred stock, \$100 each; 5,000 common, no par value; active capital, \$11,000; G. C. Sherman, R. B. Austin, G. H. Jackson.

United Radio and Electric Co., \$100,000; Louis L. Parrott, Alvin B. Parrott, New-

ark, N. J.; Noyes Shanughnessy, New York.

Radial Tool and Apparatus Co., Manhattan, \$20,000; J. Migdake, J. Walus, P. Czarnik.

General Radio Equipment Manufacturing Co., Wilmington, \$300,000. (Corporation Trust Co. of America.)

Park Radio Corp., equipment, \$100,000; S. L. Parks, D. H. Sims, H. L. Brooks, Pittsburgh. (Capital Trust Company of Delaware.)

S. W. Jawitz Co., Manhattan, electrical engineers, \$5,000; L. Gerber, R. Melnick, T. Stockek. (Attorney, L. Klinger, 201 Broadway.)

It's Radio Now

Phonographs were offered this week at one-third of last year's price, with few buyers. Many fiction and literary publications are losing circulation and advertising. It takes an unusually good show to fill a theater now.

Why spend money buying a fiction magazine and dim our eyes reading old stuff, when we can "listen in" to the broadcast, giving news as it happens, listen to the finest music or lectures; in fact, anything that interests us, with no records to buy, nothing to wind up; only just *LISTEN* to the new marvel—RADIO?

People are buying and reading too, radio publications. **THEY WANT** to know more about it, in fact, all about it. Look at your nearest newsstand. Not a radio publication on it! Every

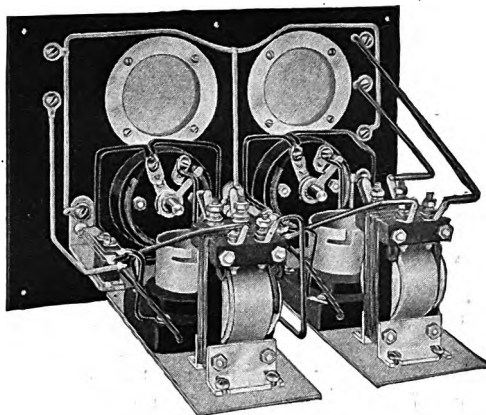
copy sold almost as soon as published.

If you have a message to put over, try a radio publication NOW. The results will astonish you. Hall-bedroom boys are not interested in radio; it is only the people that own a roof over their heads; the responsible people—real buyers and providers—who read radio publications.

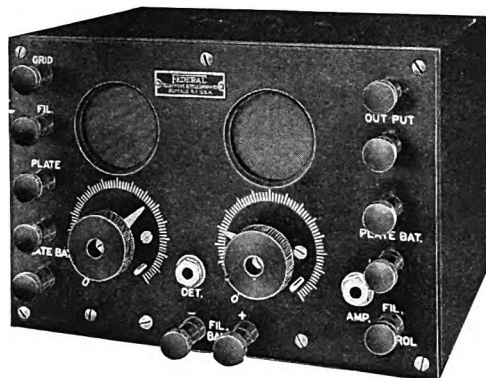
RADIO WORLD

is the only weekly in this marvelous field. The only quick-action copy today, your telephone ringing, and mail filled with orders all within one week. Let RADIO WORLD broadcast your message. Phone now, Bryant 4796 or write RADIO WORLD COMPANY, 1493 Broadway, New York, N. Y. for our representative to call. If you phone, ask for Fred. S. Clark, Advertising Manager.

Detector and One-Step Amplifier



A well-designed "Detector and One-Step Amplifier" made by the Federal Telephone & Telegraph Co., is herewith shown. Particular attention should be given to the front and rear views which show the amateur the careful construction also the shielding effects as well as the attractive front, well-made panel.



Keep Your File on Radio World Complete

Although our first issue was swept off the newsstands almost immediately after publication, we purposely reserved some copies in the office so that those who buy this (the second) issue of RADIO WORLD will be able to have complete files of the paper. If you want to subscribe now, you can start your subscription beginning with the first issue and you will be absolutely certain of having RADIO WORLD from the start. Or send 15 cents for the first issue to RADIO WORLD, 1493 Broadway, N. Y. C. (Adv.)

Discontinued

Editor, Radio World, Hartford, Ct.
New York City, March 23, '22.

Dear Sir:—

We regret to advise you that we have entirely discontinued our broadcasting program.

Yours very truly,
The C. D. Tuska Co.
C. H. Smith, Manager.

Exhibitors at the 1922 Radio Show in New York

American Eveready Works
F. Andrea & Company
L. S. Broch Manufacturing Company
Connecticut Telephone & Electric Comp.
Chicago Radio Laboratory
Diamond State Fibre Company
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United States Army, Signal Corps
United States Department of Commerce,
Radio Service

Trade News and Gossip

RADIO WORLD will be glad to receive trade notes of interest from radio manufacturers and dealers everywhere. If you are making a change in your address, are installing a new department, engaging a new manager, or are doing anything of importance in the art and industry, send a line to The Trade department and

space will be accorded you.

If you have any suggestions to offer, let's have them. RADIO WORLD wants to work hand and hand with the trade.

Address letters for this department to the Trade Editor, RADIO WORLD, 1493 Broadway, New York City.

Is Radiotelephony Dependable?

It Will Be—After a Number of Little Kinks Described Here Have Been Straightened Out

By O. C. ROOS (Fellow I. R. E.)

SUCH might be the fatal question asked of many a wireless Odipus by the financial Sphinx who determines the amount of Radio expenditures. A false answer means toying with ineffective remembrances instead of building new technical opportunities. A plan of experimental development must not ignore the interest limitations in a even one's own pet piece of apparatus.

The student who telegraphs with undamped waves for 150 miles in daylight finds that he usually is not getting more than 50 miles when he telephones. He measures his highest antenna voltage and finds it is the same in both cases, but his antenna current has a lower average value. Hence he must expect a lower range.

The story, however, does not end here, it merely commences with the fact that to telephone even with the most efficient system, we are compelled to waste energy in the voice modulator which must be used. Without it no speech can be transmitted but merely interruptions in a broad sense.

Hence with the same or greater energy input the radio telephone is apparently doomed to a relatively smaller range, other things being equal, than the radiotelegraph.

There is another "fly-in-the-ointment" which is going to call for patience and adaptability on the part of radiotel phone "fans" this summer. None other than our mutual friend "old man static"—"Q. R. N."—for short.

There are numerous hook-ups for slightly reducing Q. R. N. by the use

of undamped waves with a single frequency or electrical "tone" for signaling, but radiotelephoning consists of a whole "band" of undamped waves or "tones" and all of these must be "tuned in" at once. They must also be tuned in so that the sound will not be distorted, just as a horn or telephone exaggerates certain tones unless these tones are weakened to offset this fact.

There is no such bother in radio-telegraph work with C. W. (continuous waves).

These waves issue from the radiotelegraph transmitter in just one single steady tone which is usually too high for most human ears to hear.

When this single tone from the C. W., radiotelegraph transmitter is broken up by a chopper we get 1,000 or so interruptions per second, and this sound can be tuned in while static is eagerly squeezed out of the receiving apparatus to a large extent by mechanical, electrical or acoustical treatment. There are several promising apparatus now being tested along these lines, but they are not so good for the radiotelephone.

In the radiotelephone problem there are now two ways out:

First—use short waves. This leads to less static interference and allows smaller aerials. A 2 ft. coil aerial used on 75 to 200 meters will about absorb merely a small fraction of the Q. R. N. gobbled up by a 20 ft. loop used to receive 24,000 meter waves. Continuous wave telegraphy at 75 meters with .1 watt up to 16 volts overland using loop transmitters was tested during the war successfully. This is a fine

record and really showed to those "in the know" that the amateur had obtained a much more favorable "deal" than his critics in the pre-war period gave him credit for—when he complained about his "little 200 meters."

Second—use loop aerials, guarded by static-absorbing conductors and detuned so as to respond best at (say) two-thirds of the carrier-wave frequency, as the transmitter wave is called in radiotelephony. The signal will be weakened but radiofrequency amplification or several stages will bring it back to a practical intensity.

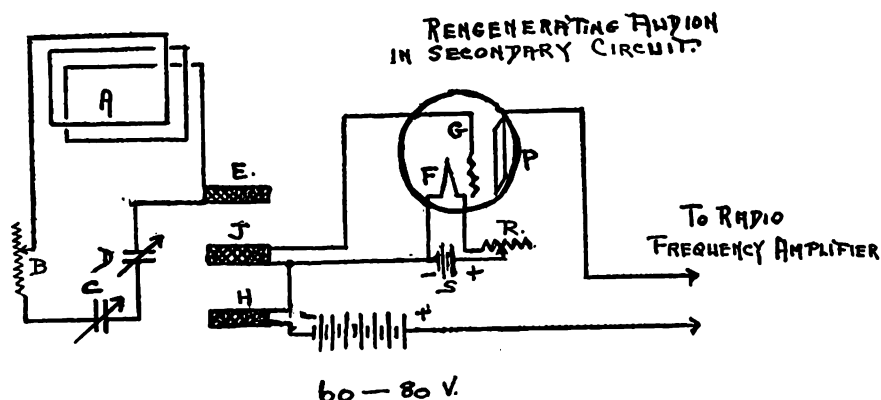
These methods do not include special arrangements where newly developed properties of circuits, based on the elimination of resistance; stationary waves or directional methods are used.

Any amateur can try out the following idea which is based on work actually accomplished by the use of regenerative circuits powerful enough to oscillate through several thousand ohms. A circuit which can do this has an effective negative resistance and if used just at the point of filament current increase or plate voltage increase at which a spark signal "mushes" it will be regenerating.

Take a fine wire loop to reduce loop-capacity with a fundamental of about 240 meters. Insert 5,000 to 50,000 ohms in it or else make it up with resistance wire. This is to make it the worst oscillator possible where static strikes it and its series tuning condenser. For coupling purposes insert a series circuit tuned to the rest of the primary circuit; this will not alter the previous "tune." It should be noted that the carrier or broadcasting wave is 360 meters and the natural "wave" of the loop itself with any external condenser is roughly 240 meters. There are other possible arrangements but this is convenient.

Now the question comes up—can we make this "wave-killing" circuit—which is sure death to most oscillations excited therein by "static", neighboring sparks, etc.—a good humble servant for some particular frequency? We can! Pupin & Armstrong have invented a system for suppressing this resistance at certain frequencies!

By regenerating in a second inductively coupled circuit at the signal or



The small loop (A) and honeycomb coils (E, J, H.) which enable the regenerative circuit in a radiotelephone to be as powerful as desired.

Mounting Crystals in Your Detector

By E. L. Bragdon

NOT everyone will find it convenient to buy a piece of galena or silicon snugly bedded in solder in a little brass cup. Many will secure the crystal and mount it themselves. In doing so there are several points worth considering, otherwise the sensitiveness of the crystal will be seriously impaired.

In the first place, a steel or iron cup should not be used for the holder. Iron because of its effect on electric circuits carrying current should never be used unless the design calls for it, such as in the cores of amplifying transformers and the diaphragm of head phones. Either brass or copper should be substituted.

There are several possible sources of crystal cups. The end connectors on cartridge fuses; the brass cap on the carbon electrode of certain makes of dry cells; or ferrules from old canes; any of these may be used provided they are of brass or copper.

After the holder has been secured, and before the crystal is soldered permanently in place, the galena or silicon should be tested for sensitiveness. It would never do to solder the crystal in place only to find that the sensitive spots were on the sides hidden beneath the solder. To test crystals, it will be necessary to rig up a miniature transmitting station—one with a range of about ten feet. This is constructed by taking a dry battery, a door bell and a few feet of bell wire. It is assumed that the beginner has made or bought his tuning coil and phones and that they are connected in the right manner. Hook the battery to the bell in the usual way, leaving one of the wires disconnected at the bell for making-and-breaking the circuit tests.

Finally, connect one end of the bell wire to the buzzer point of the bell,

and lead the other end to the tuning coil. Wind it five or six times around the tuner, but leave the end free: that is, do not connect it to any part of the tuning coil. If the set is now correctly connected and the detector is sensitive, a buzz will be heard in the phones when the bell is made to ring. Although there is no direct connection between buzzer and coil, there is an inductive connection and this creates the minute waves that produce sounds in the receivers.

Everything is ready for the crystal tests. Take some shreds of tin-foil. Place the crystal in the cup and pack

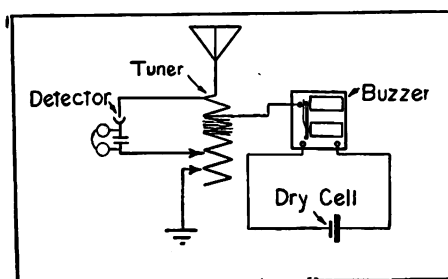


Diagram of simple method used in the selection of detector crystals. The same hook-up can be employed to assist in the adjustment of the set

the tin-foil around it. Place the "cat-whisker" on one spot after another and test with the buzzer. If the sound in the receivers is really loud, the spot is a good one. Try this same method on all sides of the crystal and find the side with the greatest number of responsive spots. This is the side that should be mounted "up" in the holder.

Crystals can be mounted in tin-foil, packed closely on all sides; but the best way is to use one of the low-melting alloys which can be purchased from a radio-supply store or mixed by

the amateur himself. If the soldering alloy is bought, the beginner should be certain that it is either "Wood's metal" or "Rose's metal". Both of these alloys can be melted with an ordinary match. The familiar solder of the plumber or electrician cannot be used because the high heat required to melt them have a bad effect on the detecting ability of the crystals.

If it is desired to mix the solder at home either of the two following formulae may be used to advantage. Formula No. 1 melts at the low temperature of 115 degrees F, about the heat of lukewarm water. No. 2 will melt readily at less than the boiling temperature of water, which is 212 degrees.

Formula No. 1		Formula No. 2	
Mercury	250 parts	Lead	26 parts
Bismuth	50 "	Bismuth	50 "
Tin	25 "	Tin	12 "
Lead	25 "	Cadmium	10 "

To solder a crystal in place, melt enough of the alloy to fill the cup and then place the crystal in position with the sensitive side uppermost. Press the crystal into the alloy until the top surfaces of each are almost on the same level, then leave the crystal alone while the alloy cools. Throughout all these operations—from the time the crystal is first picked up to make the tests until it has been anchored in the solder—use extra care that your fingers do not touch the sensitive surfaces any more than is absolutely necessary. After the crystal is in its holder and the latter is in place on the detector stand, wipe the surface with carbon bi-sulphide or carbon tetrachloride. This will remove all oil and other foreign substances.

The Sending "Bug"

Paul F. Godley was right when he claimed that 75 per cent. of the amateurs who make or buy their own receiving sets for concerts, get the amateur-sending "bug." The other 25 per cent. are coming along slowly.

P. E. Wiggins, of Pittsburgh, made a pertinent remark when he said that an amateur, in Canada, picked up KDKA on 180 meters just as clearly as on 360 meters. Who was off tune—KDKA or the amateur?

The American Telephone and Telegraph Company has gone into the backwoods even—and installed a wireless phone in a lumber camp in the northern part of North Carolina.

(Continued from preceding page)

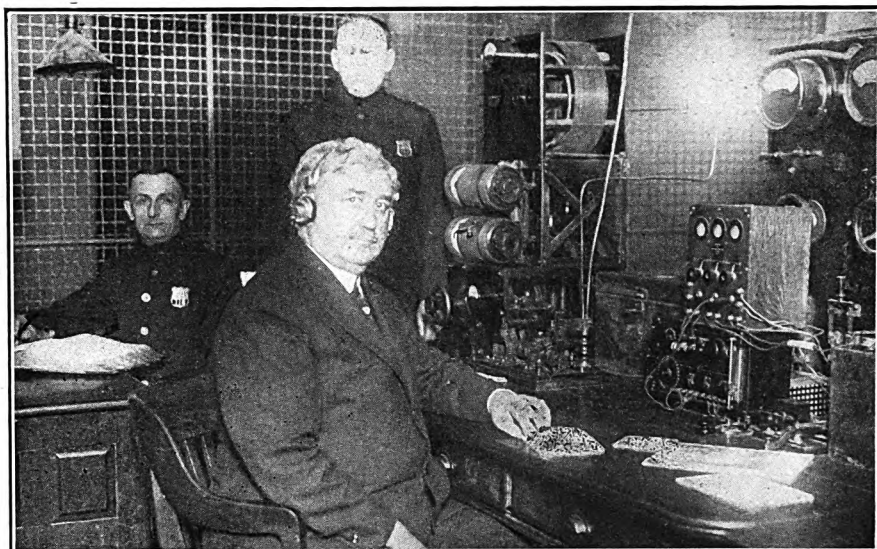
"broad-casting" frequency they "wipe out" the effect of the high resistance in the loop and allow the carrier frequency to go thru and also a band of frequencies near it produced by the voice. This depends on the sharpness of tuning in the loop circuit and can be controlled by changing the amount of added resistance mainly. It is more easily controlled this way, when the loop capacity is small. The regenerative circuit can be as powerful as desired and the simple Hartley hook-up is ample. The accom-

panying sketch gives a schematic diagram of the method.

As a further precaution against static exciting the secondary circuit, the primary circuit can be tuned to 540 meters. The device of detuning can be resorted to if radio frequency amplification is available.

To sum up—use short waves, loop aeriels, high resistances in the aerial, powerful regenerative currents, radio-frequency amplification and detuning and you will have gone a long way to meet "old man Q. R. N. on a fair footing next June.

Police Chief Using Radio Receiver



(c. International.)

Commissioner Enright of the New York Police Department Listening in on a Radio Concert Over the Newly Installed Radio Set at Police Headquarters. A New Radio Section of Police Department Has Been Inaugurated and New Ways of Using Radio to Be Used in Apprehending Criminals Are Being Devised.

The Radio World's Log

RADIO WORLD will give space to a record of amateur stations heard and worked. This section will be known as The Radio Log, and it is requested that amateurs forward their lists in, with their names and addresses to the Radio Editor, Radio World, 1493 Broadway N. Y. City, N. Y. Those

received up to Thursday A. M. of one week will appear in the following week's issue. C. W. and Spark stations should be arranged in two distinct groups.

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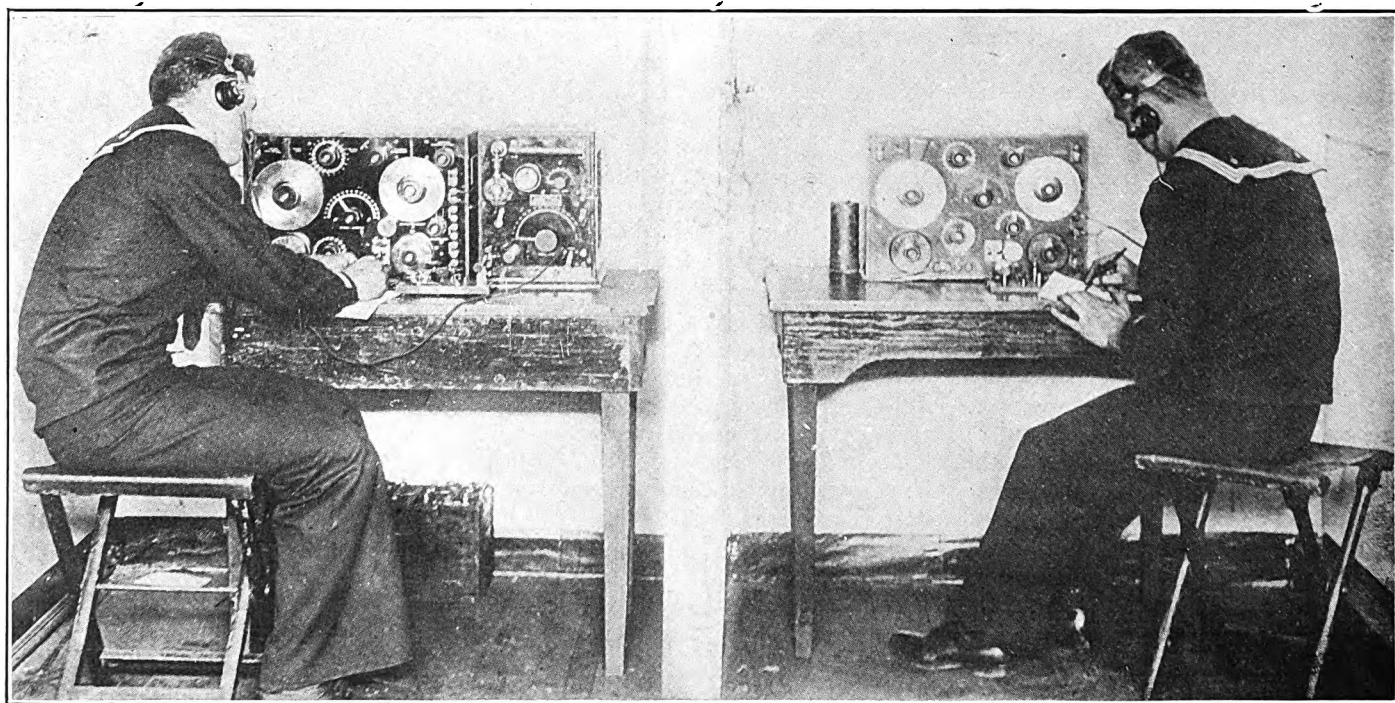
Regenerative Tuning

Owing to the sharply tuned waves of radio telephone signals, their reception at a distance usually requires careful adjustments of the receiving circuits, and is not accomplished as readily by the novice as is the reception of spark telegraph signals. In view of the differences of manipulation of the various types and makes of receiving sets, it is possible here to give only a general outline of the procedure to be followed.

Signals received are greatly strengthened by use of a regenerative circuit, properly adjusted. To obtain regenerative action, carefully increase the plate inductance or tickler coupling until a slight hissing or hollow sound is heard in the phones, then move the adjustment back slightly until the hissing just stops. If the circuit is functioning properly, it will be found that phone and spark signals can thus be regenerated and their intensity increased many times. The slight hiss just mentioned indicated that the detector circuit is in a state of oscillation; this adjustment should be used for receiving continuous wave telegraph signals, and will also be found advantageous initially to "locate" radio telephone signals from distant stations.

Be sure to get Radio World every week so you can bind your 52 numbers into one volume. Subscribe. \$6.00 yearly, \$3.00 six months, \$1.50 three months. (Adv.)

Cops of the Air



U. S. Naval operators shown at work while guarding wave lengths in search for breakers of the rules and regulations governing radio communication. (c. by Keystone View Co.)

Human Encyclopedia of Radio



(c. Keystone View Co.)

William B. Terrell, Uncle Sam's chief radio inspector, whose offices are in the Department of Commerce, Washington, D. C., is one of the busiest men in the country. Since radio method of communication became popular, he has been flooded with inquiries from ambitious fans. Chief Terrell cannot possibly reply to all the questions hurled at him, because many are of a distinctly technical nature and require lengthy answers. However, it is not necessary to bother him if you expect an extended reply. Just send your questions to the Inquiry Editor of RADIO WORLD. He will do all in his power to help you.

Radio Advice on Fire Precaution

George B. Muldaur, general agent of the Underwriters Laboratories, gave an interesting address by radio-telephone, from the Westinghouse broadcasting station at Newark, N. J., on "fire prevention" in the home.

In this country, said Mr. Muldaur, "15,000 human lives and \$500,000,000 worth of property are lost yearly in fires. The property loss does not include the cost of fire protection, the maintenance of fire departments and fire-extinguishing apparatus, or the payment of fire departments and fire premiums; but, solely, actual property destroyed."

It is estimated that almost 90 per cent. of the loss is strictly preventable and, perhaps, 75 per cent. is due to carelessness. He suggested several questions which one should not forget:

Where is your nearest fire-alarm box?

Do you know how to operate it?

Does this box need a key to open it?

Do you know where key may be found instantly?

When did you last go over your house in order to locate fire dangers?

Are the theatres and motion picture houses you attend properly protected?

"A clean house is a safe house," said Mr. Muldaur, "and an annual house-cleaning, is as slovenly as a weekly bath. If kerosene lamps are

used, see that the kerosene is kept in a safe place—away from anything inflammable. Be careful where you throw matches. Keep all rubbish out of cellars and basements and keep all papers in a specially safe place. Protect the walls from the heat of stoves and pipes. Protect all floors under stoves by means of metal or asbestos covering. If your house has wooden

shingles, keep them well painted with approved roofing-paint. Old and dried shingled roofs have been known to catch fire from sparks carried more than a mile by the wind."

Bed Springs Radio

Declaring "this wireless business has got to stop", E. C. Beck of Chilli-cothe, Illinois, said that he has not been able to sleep for two weeks because of hearing voices and music in the air and because of shocks he gets when he goes to bed.

One night, he said, he awakened as in the grasp of a phantom. He says music, lectures, market reports and voices break the silence of his bedroom each night, and he blames it all on a huge radiophone sending set at Bradley College, Illinois.

Beck has no radio receiving set; but radio operators say, his bed springs, an ideal wireless aerial, may attract the signals.

A Mystery Solved

The mysterious call WRW, which recently agitated listeners was located at Tarrytown, New York. It is owned and operated by the Tarrytown Radio Research Laboratory, Frederick Koenig in charge. It was an experimental station until government licenses were distributed.

WRW will continue broadcasting, arranging its hours so as not to interfere with WJZ's program. At present it operates between 6:30 and 7:15 p. m., and between 10:15 and 11 p. m., on a 360-meter wave length.

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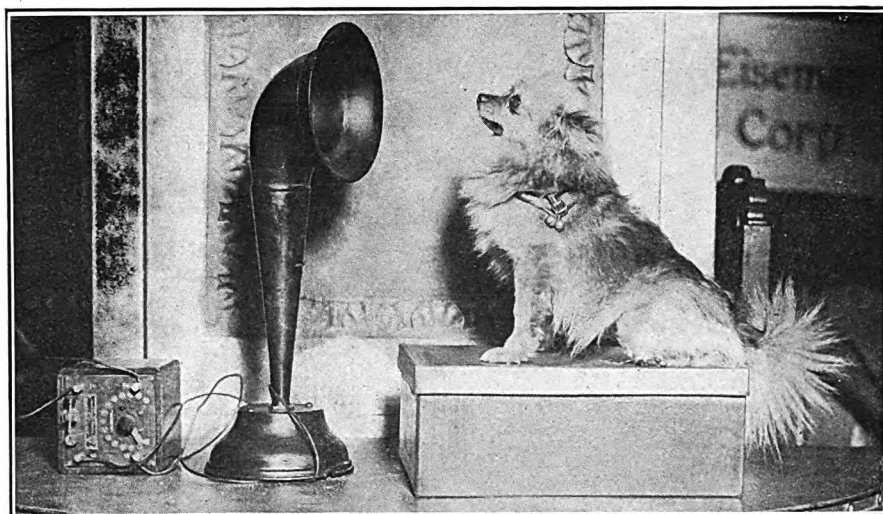
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His New "Master's Voice"



(c. Keystone View Co.)

He is known as "Wuffie," the radio dog, and he was one of the novel features at the recent Radio Show at the Hotel Pennsylvania, New York City.

What's Required

In order to receive radio telegraph and radiophone signals, the following equipment is necessary:

- Antenna (Aerial)
- Ground Connection
- Antenna Grounding Switch
- Tuner
- Detector (With necessary batteries, etc.)
- Regenerative circuits
- Head telephone receivers.

The following may be used in addition:

- Amplifiers, with necessary accessories
- Loud speaking horn.

The cost of a complete radio receiving outfit ranges from about \$35.00 for a simple set with mineral detector to \$200.00 or more for a highly sensitive installation of the best grade. For \$125 or less, a very satisfactory complete set may be installed, containing an electron tube detector; additional equipment may then be added at any time to reach the highest sensitivity.

What We Want

RADIO WORLD is in the market for good technical articles and illustrations by men who thoroughly understand the subject. Such material, when submitted by mail, must be accompanied by stamps for return postage.

Her Own Radiophone

A large Radiophone amateur station is being installed at Rye, N. Y., for Rene Riano, of Irving Berlin's "Music Box Revue." This station is for sending and receiving messages. Miss Riano is studying to become an expert operator.

Proper Adjustment of Detector and Amplifier

Before signals can be received, the detector must be in proper adjustment. Mineral detectors are adjusted by varying the pressure and spot of the contact crystal, until the note of the test buzzer is heard most clearly through the 'phones.

Gas-content (soft) detector tubes are adjusted by raising the filament current gradually, until a slight hiss is heard in the 'phones, and then reducing this current until the hiss just stops. Care should be taken during this adjustment to set the regenerative inductance or tickler coil at its minimum value. The plate ("B" battery) voltage at the same time should be so adjusted, by means of variable battery taps, or preferably by means of an "A" battery potentiometer, that this hiss commences at as low a filament current as possible. Most gas-content detector tubes require a critical plate voltage somewhere between 18 and 22 volts. The adjustment is most easily made by the use of an "A" battery potentiometer, which connects the negative end of the detector plate battery to any desired point between the positive and the negative terminal voltage of the filament "A" battery, thus providing a continuous 6 volt variation.

Many operators who wish to avoid the critical adjustments necessary for operation of a gas-content detector tube, find it convenient to employ a "hard" tube (amplifier tube) in its place, at a slight loss of sensitivity. These highly evacuated tubes are not critical in adjustment, and have no "hissing point". The best plate vol-

Loud Speaking Horns

Loud speaking appliances are on the market by means of which it is possible to reproduce even weak signals with any intensity desired. Signals received with good intensity in the head receivers may be heard over an ordinary room, by means of one of the low-priced loud speaking horns on the market, or even by the attachment of a simple horn directly to an ordinary ear receiver. WHERE USED AS A PART OF THE GREAT VOLUME OF SOUND IS REQUIRED, SPECIAL ADDITIONAL AMPLIFIERS SHOULD BE LOUD SPEAKING EQUIPMENT. It should be borne in mind that more or less distortion often results from great amplification of signals, especially with improperly designed loud speaker equipment or where such equipment is not properly adjusted. The quality and distinctness of the signals received will, therefore, in general be better when received through the ear receivers, than when reproduced through a loud speaker.

Antenna Grounding Switch

To avoid the accumulation of electrical charges on the antenna, and to prevent damage to the receiving set in case of nearby lightning, a protective device, which provides a direct path from the antenna to ground, should be installed. This may be a small single pole throw switch, used to shunt across the receiving set when not in use, or still better, single pole double throw switch which disconnects the antenna from the receiving set and connects it directly to ground. For use with transmitting stations, the National Underwriters Regulations specify the use of a larger pole, double throw switch, is pre-grounding switch, attached outside the building; a 100 ampere, 500 volt single pole, double throw switch, is prescribed, connecting to ground outside the building through a copper wire not smaller than No. 6, B & S gage. Complete grounding equipments suitable for transmitting sets or for large receiving antennae may be purchased from any radio supply house.

tage for these tubes when used as detectors is best found by trial, but is not critical.

Amplifier tube filaments are burned at just sufficient brilliancy to give maximum signal strength. Any plate voltage from 45 to 90 volts or even higher may be used on amplifiers, the higher values of plate voltage generally giving somewhat increased amplification.

Answers to Our Readers

H. W., Rockland, Me.—Can I use a 2 ft. square loop for radiophone concerts?

Yes. There are however several factors to be looked into in your case. You must know the inductance or the fundamental wavelength of the loop. We cannot go into methods of getting this now but will give it consideration in the next number. Get some friend to find it for you. If this wavelength is longer than that of the broadcasting station you must take off turns of wire until it is about two-thirds of it and then add a condenser. Try 8 turns No. 20 D. C. C. $\frac{1}{4}$ apart.

You must next have at least 2 radio frequency stages of amplification before you reach the detector unless you have a vacuum tube detector and 2 stage amplifier and are within a few blocks of the broadcasting stations.

Of course you will need a 2 stage audio frequency amplifier in any case, as your loop picks up only about 1% of the energy handled by the average 100 ft. single wire antenna.

Please give more detailed data if you wish exact information.

Q. J. F., Jersey City.—Can I get more distance with a "T"-antenna than an "L" inverted?

A. Your facts are too vague for an exact reply. The same horizontal wire used as part of a "T" gives less current when tuned to a given wavelength than when used as part of an inverted "L," using the same lead-in wire. The natural wave length is shorter than that of the antenna when made into an inverted "L." This would require more tuning coil for the "T" and might mean a better coupling to the detector, thus neutralizing the difference between them to some extent. It all depends on the exact conditions given.

Q. S. F., N. Y. C.—How far can a 500-watt set reach over sea in daylight?

A. This depends on wave-length, and antennae at transmitter and receiver also location of station. A large concern in New York has a 500 watt output tube set on 300-600 meters which has reached 1,600 miles in daylight over sea and is reliable for 1,000 at all times.

W. M., Scarsdale, N. Y.—Why is a C. W. transmitter less powerful when used as a telephone than a radio telegraph?

A. The radio telephone sends out less energy under the same condi-

Radio World Will Help You Solve Your Problems

THE editors of RADIO WORLD will be glad to answer inquiries from readers. If you are experiencing any trouble with your receiving apparatus, write us. Tell us what your trouble is, what kind of apparatus you are using and any other facts that seem necessary. If you wish to install a receiving set and need advice, write us; but state whether you live in an apartment or a private house and your distance from the nearest broadcasting station. Questions of general interest will be fully answered in this department.

Inquiry Editor, RADIO WORLD,
1493 Broadway, New York City.

tions than the radio telegraph, having the same "peak" voltage on the antenna. "Peak voltage" is the highest measurable voltage at any instant.

A. D. N., Brookline, Mass.—Is there a special reason for using cage antennas?

Yes—electrically they handle a given amount of energy with less rise in voltage and therefore less tendency to leak to ground than any other form. This advantage comes especially into play when they are used as transmitters; since Austin, Miller and others have shown that trees, poles, and large insulating masses close to a station often absorb energy from a highly charged wire when the charge reverses rapidly.

There are mechanical advantages afforded by the cage antenna in battle, as a single shot will not bring down a cage antenna owing to the loops distributed thruout its length to separate the wires. The flat top antenna is not protected in this manner.

A. P. R., Mount Vernon.—Is carborundum good to use in a direct coupled set for radiophone work?

If you cannot procure galena or silicon in a hurry and are very close to a broadcasting station, you may get good results. Cheer up, when the big fellows are broadcasting across the continent. That close by with galena and direct coupled antennas will have to use a less sensitive crystal or else a loop instead of the antenna. They may use carborundum as a protection against overwhelming intensities from transcontinental stations. Meanwhile use galena if possible, every dealer keeps it.

J. S. C., New York City.—I am experimenting with a harp antenna of 4 wires spaced about 6% of their length apart. Should I get more energy out than with one?

Yes. These four wires have roughly according to an old law called Fleming's rule—about twice the capacity of one and their current is twice as great and their useful energy five times as great. Therefore the equivalent "useful" resistance they introduce into the circuit when you press the key to radiate this energy—is four times as great. This does not mean, however, that you can get four times the energy out of them for receiving that you can with one wire. The conditions are different. In a transmitter you "snap-the-whip" at the base of the antenna. With the receiver the case is different—the incoming waves are like a broad violin bow that "strikes" the antenna from top to bottom at once.

If instead of a transmitting chopper there was a transmitted current changing in value cyclically 1,000 times a second by being modulated through the action of the human voice on a radio telephone transmitter the receiver telephone would vibrate accordingly, since its steady pull would pulsate 1,000 times per second. Similarly other notes between 150 and 2,500 per second would give their responses and since speech is a compound of all of these frequencies you will have a receiver diaphragm reproducing the voice waves.

It is thus seen that a crystal or vacuum tube converts an impossible alternating or reversed pull into a steady pulsating pull.

We Wanted To Know

The following letter explains itself:

Radio World,
1493 Broadway,
New York, N. Y.

Gentlemen:—

At the direction of the Superintendent of Police, I am writing to acknowledge your letter of March 16th, requesting a photograph of a police officer equipped with a radio telephone, and beg to inform you that we have no photograph such as you request.

As a matter of fact, the Department has made no advanced tests of the use of radio phone, and the matter is still in its infancy.

Sincerely yours,

Martin E. Mullen,
Sec'y to Superintendent of Police

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Service to Farmers

The State Agricultural College of Wisconsin was the first institution of its kind to begin broadcasting crop information and prices to farmers, says Wm. Jermaine in the "Times" (Seattle, Wash.). It began last fall with three subscribers; today 127 sets of receiving instruments are eagerly taking everything it sends out. The agricultural colleges of New York and Ohio were the next to take up this new work, and their experience has been as successful as that of Wisconsin. The theory is that before long the farmer will have a wireless receiving set just as he now has a telephone, and that it will take the place of the telephone for everything but communications between individuals.

The business possibilities of the new system are great. Already a limited number of farmers are receiving crop and market information just as reliable and as prompt as that which a stock broker gets in his office from his ticker.

Secretary Denby Telephoning a Radio Naval Station



(c. Underwood & Underwood.)

One of the first government offices to be equipped with radio, was that of Secretary of the Navy Denby. By its use, the Secretary is able to keep in touch with all naval stations on the Atlantic Coast. The radio has done much to simplify and condense his work.

U. S. Attorney-General Charges Radio Monopoly

The report from Washington that Attorney-General Daugherty has asked an investigation into a monopoly alleged to control the prices of radio apparatus, and that a bill has been introduced in Congress by Representative Britten, of Illinois, to that effect, caused considerable consternation just as RADIO WORLD was going to press. One of the leading radio corporations informed us by telephone that the charges are absolutely without foundation.

In its next issue, RADIO WORLD will publish an important article on this subject, based on interviews and information secured from those directly interested.

Great Men Change Accepted Facts

It appears to us that a turn in the habits of thought of many men of science is coming about. They are not seeking the mourners' bench or weeping over their sins or singing revival hymns or even growing orthodox from the standpoint of dogma; but there appears to be coming over a considerable number of leading men of science an enlivened reverence for that which is beyond human knowledge, says "Metallurgical Engineering" (New York). It shows itself in various ways. Sir William Crookes did, and Sir Oliver Lodge does, believe in ghosts. They have not many followers among their colleagues. The tendency is rather toward a less definite quality of mysticism; toward a belief in a greater illumination than is ours. It is not organized and it does not follow creeds or catechisms or articles that were drawn and recorded when, according to the best human understanding, the earth was flat like a cake; when it was the center of the universe, when the sun was a great lamp that was raised in the morning and lowered at night, and the lesser lights, the moon and stars, were little incidents to mitigate the darkness.

Earlier generations accepted orthodoxy. Sir Isaac Newton was a man of unusual piety. Michael Faraday was a sound churchman. Louis Pasteur was among the last of the great men of science to whom the "requirements of faith" were welcome.

The present tendency is independent of dogma. It does not insist on any particulars. It does not condemn. It seeks the Greater Illumination and finds hope and comfort in the quest.

On January 8 last, Professor Michael I. Pupin of Columbia made a memorial address at St. Paul's Chapel on the campus in honor of those who in their lifetime had advanced the honor of Columbia University. Now to such persons as know him casually, the genial professor of electro mechanics would be about the last one they would expect to see in a pulpit preaching a sermon. But his beautiful "Herdsman's View of Human Life" was indeed a sermon. He harked back to the time when, fifty years ago, he had helped the village herdsman to guard the grazing oxen through the night on the hills of Serbia. The mystic thoughts of ancient reverence that inspired the watching boy have not been killed by the study of science. It was beautiful and reverent and sincere, and it did not offend the understanding. Many will remember the plea for spiritual vision made by Professor Barkerville in his address at the Great Hall of City College during the September joint meeting of the chemical societies. It was his last public utterance, this urgent appeal for the search after light to come from beyond our ken. Dr. Charles P. Steinmetz in his illuminating contribution to the current number of "Harper's Magazine" has approached close to the boundaries of mysticism.

It is an excellent thing to "get down to brass tacks" in our discussions of particular things and in the consideration of principles and processes. But the world is not made up of brass tacks alone. There are vague shapes in the minds of men and women that are potent to build up or to destroy.

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Ellabelle May Doolittle

She Reads a New Poem with a
Radio Punch

By Bide Dudley

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MAYOR CYRUS PERKINS WALKER on his return from Kansas City last week called a public meeting in Hugus Hall for a discussion of the radiophone. The Mayor had listened in on a concert from St. Louis while in Kansas City and wanted to tell his townsmen of this new invention. A large crowd was present.

"The radiophone is a great thing," he said in his opening remarks. "I studied it in Kansas City and am now an authority on it."

"Are you a radiator?" asked Smut Harkins, who is more or less of a sidewalk comedian.

"You keepa still," yelled Tony Borgello, the fruit stand man, who is deeply interested in the subject.

"I do not keep a still," replied Harkins.

The Mayor rapped for order. As he was squaring off to speak again, a slender girl, gowned in swish-cloth, trimmed with imitation jelly-beans, stepped onto the rostrum. She was Ellabelle Mae Doolittle, Delhi's far-famed poetess.

"Excuse me, friends," she began, "but I have here a little poem on the radiophone. Calm your tone; it's all my own. I'll tell you of the radiophone."

The crowd became quiet at once. Many sat with hands on their ears. Miss Doolittle read the following:

Listen to the wireless phone,

Singing on the air.
With you I'll not pick a bone:

Wonderful, I declare!
Tune in on the proper wave.

And you will get the message,
For great things the way you pave,
Surely this is not guessage.

My Sister's child, Teeney Ricketts,
Giggled in Sabbath school.

Stop that, you foolish jiggets,
From Sebastapool.

But speaking of the radiophone—
It is some invention.

My dad has a horse for sale—a roan,
A fact I wish you'd mention.

Coming as a surprise the poem struck the crowd dumb with its grandeur, but only for a moment. Soon belam broke loose, as those present applauded with great gusto.

All were pleased.

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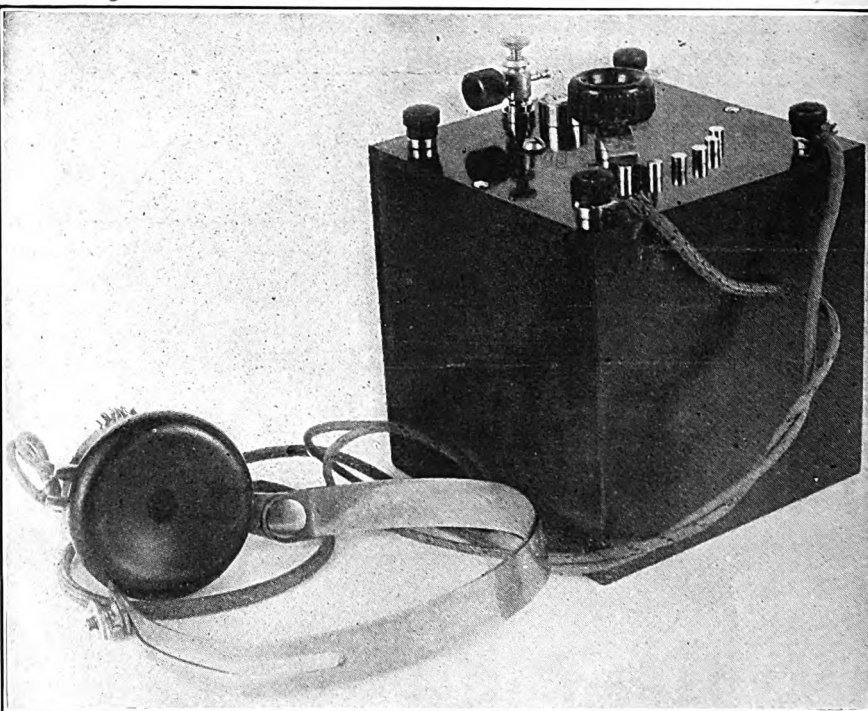
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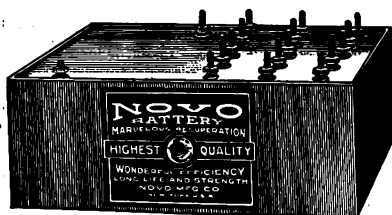
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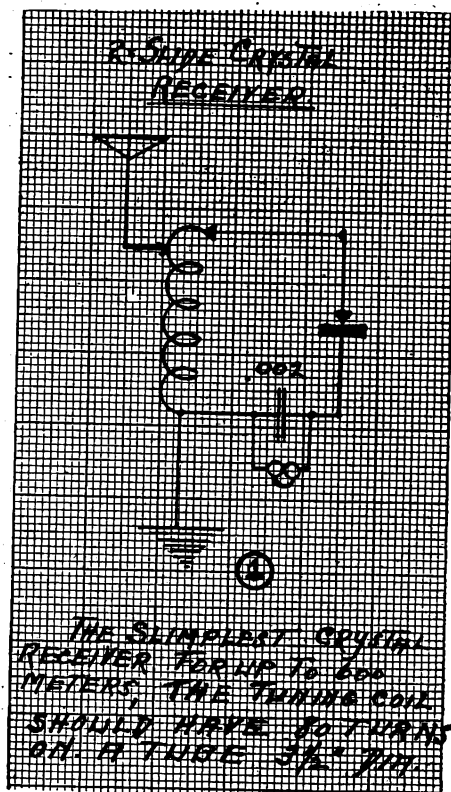
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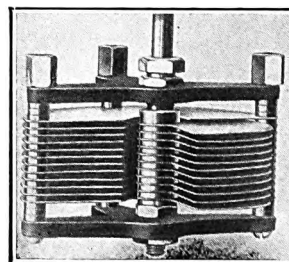
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	100 ft. Hard Drawn Copper Aerial Wire..	.65	.49
4501	Aerial Insulators ..	.30	.23
9280	22 1/2 Volt small "B" Battery	1.50	.90
9284	22 1/2 Volt large "B" Battery	2.00	1.40
9281	22 1/2 Volt large variable "B" Battery...	2.75	1.90
9285	45 Volt double size Variable "B" Battery	4.00	2.80
	Brach Lightning Protectors	2.50	2.37
	Porcelain Vacuum Tube sockets .....	.60	.58
	1/4 inch Slider and 10 inch Rod .....	.55	.45
	Coils wound on Tube Audiotron Detector Tubes	1.25	.75
	Crystal Detectors (N. Y.)	6.00	5.50
	Mounted Tested Galena	1.75	1.20
	Extra Large Variometers45	.25
	6.00	5.50

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RADIO WORLD

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Vol. I. No. 3.

April 15, 1922

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And Still They Come!

We had something to say on this page, last week, regarding the way RADIO WORLD No. 1 was received by the public.

Our entire first edition, including the substantial number of extra thousands printed, was swept out of our bindery within twenty-four hours after publication.

History repeats itself. The second edition, larger by many thousands than the first, was ready for distribution to the news trade on Wednesday. This edition, including another substantial extra printing, was taken in its entirety by the American News Company and the trade generally by Thursday noon. As this is being written, to be rushed

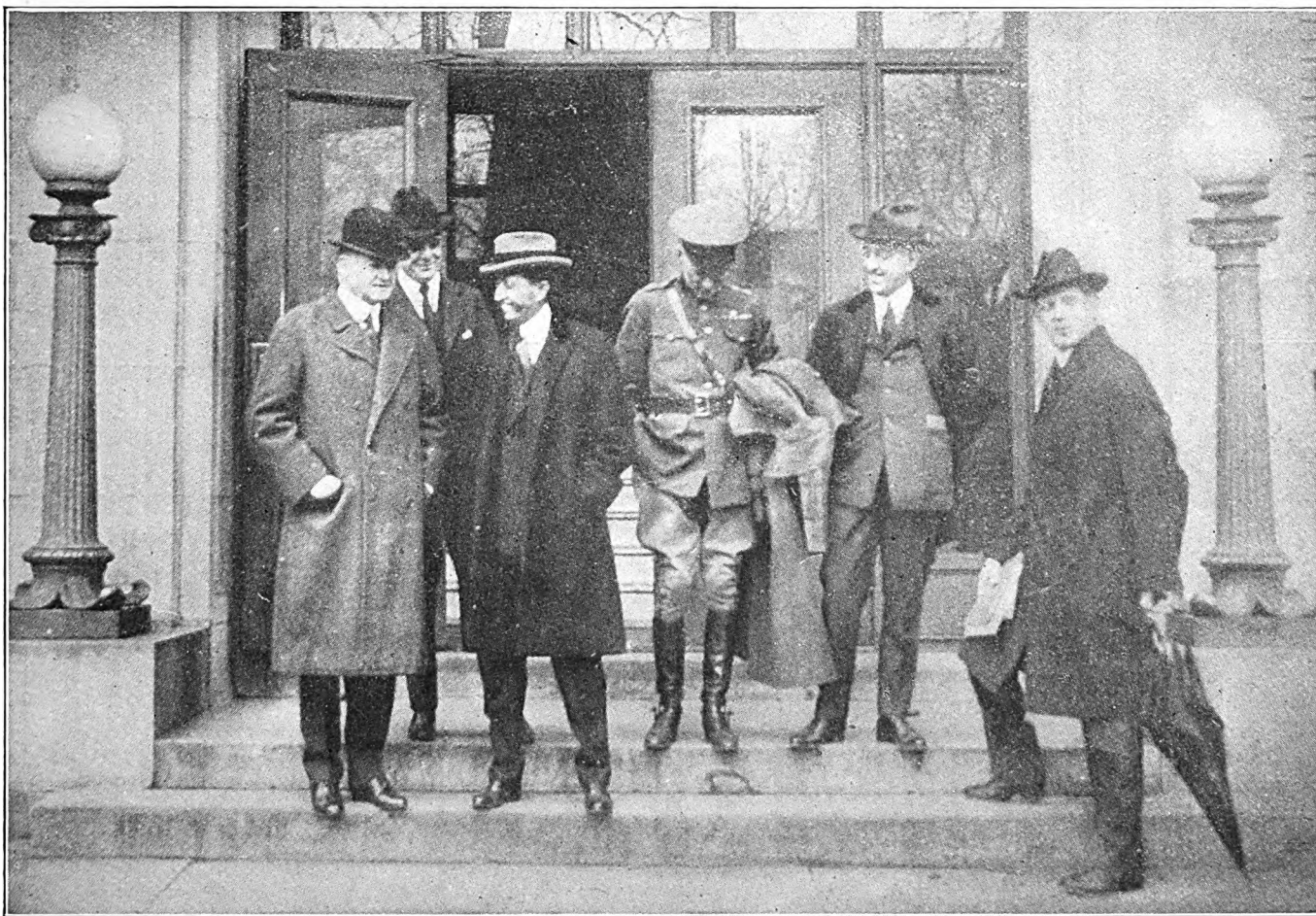
into type, there is not a copy of RADIO WORLD No. 2 to be had from the publishers, although there are cries from all quarters for more copies.

We are already printing a still larger third edition. We believe it will be sufficient to supply the demand—but we are not sure. Things are moving so quickly with RADIO WORLD that we can only promise to do our best.

Incidentally, yearly, half-yearly and quarterly subscriptions are tripping their way into the office by every mail.

Yes, indeed, thank you; we are really very happy!

THE PUBLISHER.



(c. Sport Commercial, N. Y.)

Leading members of the Radio Conference in Washington, D. C., assembled by Herbert R. Hoover, Secretary of Commerce. A tentative but important report of this conference is published in this issue of RADIO WORLD, page 9. In the above picture, from left to right—Secretary Hoover, Mr. Stetson, Will H. Hays, former postmaster general; Major-General George O. Squier, U. S. A., chief signal officer of the Army; United States Senator Kellogg.

TIFA

Five Important Radio Elements Invented at Columbia University

By Michael I. Pupin

Head of the Electro-Mechanical Department of Columbia University, New York

THE most essential elements of the radio art, as practiced to-day, are: electrical tuning, rectification, negative resistance, the audion, the feed-back circuit, and the vacuum-tube oscillator. It is a very significant fact that of these six essential elements, five were invented by Columbia University. Three, namely, electrical tuning, rectification, and negative resistance were invented by myself; whereas, the feed-back circuit and the vacuum-tube oscillator were invented by my former pupil, Edwin H. Armstrong.

The electrical tuning was invented by myself over twenty-five years ago, and the patents thereon were sold to the Marconi Company of America, in 1902. My rectifier, consisting of a

balanced electrolytic cell, was first described in 1899 and was employed by myself and others, at that time, for the rectification of Hertzian waves. The patent was sold to the Marconi Company of America, in 1902. This rectifier was later displayed by a crystal rectifier at first, and, later by the Fleming Vacuum Tube Rectifier which is used to-day.

The fundamental idea, however, of employing the rectifier in wireless reception, is mine. The so-called negative-resistance compensator was first developed by myself and employed for the purpose of reducing the resistance of an oscillatory circuit to as small a limit as may be desirable for the purpose of producing a circuit of a very high degree of resonance, so

that extremely sharp tuning may be obtained.

I accomplished this by means of a magneto-electric generator, and, later, in collaboration with Mr. Armstrong, the same thing was accomplished by means of Mr. Armstrong's regenerative circuit. A patent was obtained by myself for a resistance compensator produced by a magneto electric generator, and another patent was obtained by Mr. Armstrong and myself, jointly, for producing a resistance compensator by means of a vacuum-tube generator. These patents, as well as Mr. Armstrong's patents for the regenerative circuit and for the vacuum-tube oscillator, were sold to the Westinghouse Company in November, 1920.

Ground Connection as Vital as Antenna

FEW beginners in radiotelephony realize sufficiently the prime importance of a good ground-connection. To many, the principal part of a receiving station is the aerial; whereas, if the truth were known, the ground is every bit as vital to good clear and dependable reception as the aerial. Altogether too many amateurs spend hours in erecting the antenna, seeing that the wire or wires do not touch other objects and inspecting joints to see that they are securely soldered. But the ground is left until the last and is then made by twisting a few turns of bare wire around the most convenient pipe.

The above simple sketch explains without intricate terms the essentials of a radio receiving-station. The radio waves as they pass through the air and the ground are oscillating in character. This means that they first go from the transmitting aerial to the receiving aerial, then to the ground, and from there back to the ground of the transmitter. After this cycle is completed, they reverse their direction and travel down through the ether to the transmitting antenna. This scheme of going first one way and then the other is made possible because of the condenser effect.

It is obvious from the foregoing that the ground must play its part as satisfactorily as the aerial. Whatever applies to the aerial applies likewise

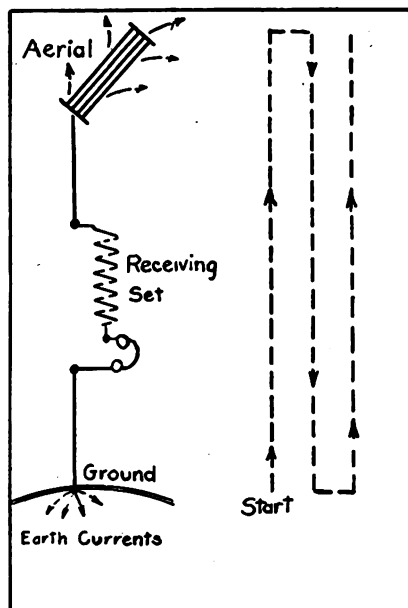


Diagram of a simple receiving station showing how the impulses—on the signals or sounds—pass from the earth to the antenna and then back to the earth.

to the ground. For instance, the aerial is made up of copper wire of fairly good size. Such as No. 14 will give good service.

This is necessary to reduce the an-

tenna resistance. Similar precautions should be taken with the ground. It should be made to present as low a resistance as facilities permit, then the minute radio currents can pass down the antenna, through the set and thence to the ground without being forced to overcome obstacles.

It is safe to say that most grounds could be improved, but this is not always advisable because of the expense involved. A heating system may or may not make a good ground. The chances, however, are against it. If the receiving set is connected with the earth by a connection on a radiator, the oscillating current must overcome the ohmic resistance at each pipe-joint. These joints are usually well leaded to prevent leakage, and this insures high resistance.

If the ground connection is made, a gas pipe, the beginner may find that he has no ground at all. For the protection of their patrons, gas companies, as a rule, insert a wood or composition pipe-insulator somewhere between the gas meter and the first burner. If the amateur discovers one of these insulators, he should not overcome the difficulty by bridging the insulator with a piece of heavy wire, as he is then nullifying the good work of the gas engineers.

Instead, the the ground wire should be carried beyond the meter before attaching to the pipe.

First Principles of Electricity as Applied to Radio

By John P. Miles

ELECTRICITY, from the very moment of its discovery, has remained one of the greatest mysteries. Many theories have been advanced as to the real meaning of the term, "electricity." It is the purpose of these short articles on electricity to present to the amateur who is just beginning his electrical education, the elementary principles of electricity.

Electricity is assumed to consist of small particles which are called electrons. When electrons follow each other in rapid succession as they do on a wire, an electric current results. In order to have a flow of electrical current, there must be more electrons in one portion of the circuit than in another. There is an even flow of electrical current all over the surface of the earth which is considered to be the zero potential. It is only, however, when these electrons are set in motion that electricity occurs. These electrons may be set in motion by a storage or dry-battery, or by means of a machine which generates electricity and which is called a dynamo or generator. The purpose of the generator is to push the particles called electrons over the best possible conductor.

If there is a steady flow of current in one direction, it is called a "direct current." If the current flows first in one direction and then in the opposite direction, it is called an "alternating current." If it always flows in one direction, but its value changes between the limits of a maximum and minimum, it is then called a "pulsating current."

As we have already shown, in order to secure a flow of current, it is necessary to have a difference of potential existing in the circuit.

About the simplest way of bringing this about is by means of a chemical cell. Such a cell transforms chemical energy into electrical energy and is known as a primary cell. A chemical cell consists of two dissimilar elements, or in other words, two unlike metals immersed in a dilute acid or alkali solution. In its simplest form a primary cell consists of two strips of zinc and copper immersed in a dilute solution of sulphuric acid. If the exposed terminals of these plates are joined by an electrical con-

ductor, the cell is capable of supplying a continuous flow of electricity. It is observed, that as the current flows, a vigorous chemical action takes place, and that the zinc strip wastes away. The consumption of the zinc furnishes the electromotive force necessary to drive the electric current through the cell and through the external circuit. The chemical action which takes place in the cell may be briefly described as follows:

When the copper and zinc strips are connected by the conductor and the current begins to flow, the sulphuric acid attacks and dissolves the zinc in the acid, forming zinc sulphate. During the formation of the sulphate some of the hydrogen contained in the sulphuric acid is liberated in the form of bubbles which immediately appear on the copper plate. The hydrogen thus liberated carries a negative charge of electricity which travels across the acid to the copper plate, and there giving up its charge to the copper plate and passing off as gas. This causes a difference of potential on the two plates so that a current flows in the exterior circuit.

This difference of potential may be more easily explained by reverting to electrons. The reaction of the sulphuric acid with the metal, changes the physical shape very slightly, of course, in a unit of time, and in consequence of this eating away of metal brings about a change in the density of the electrons on the metal. As this rate of change on the two dissimilar metals is unequal, there is consequently a difference of potential set up between the two plates.

The electric potential or voltage of a cell therefore does not depend upon the size of the cell but only on the elements used.

However, the quantity of electricity which can be easily taken from a primary cell, such as the one described, and the speed with which it can be drawn off, do depend on the magnitude of the reaction taking place; that is, the larger the cell the greater the current supply available.

The metals which may be used as the poles of a cell are listed below according to their relative potential when dipped in a solution acting as an electrolyte. They are arranged in

such order that any single element will be the positive pole of the battery when used with the metal next below it on the list, and the negative pole when used with the element next above it.

Positive Terminal.—Carbon
Platinum
Silver
Copper
Lead
Tin
Iron
Zinc—Negative Terminal

The maximum electric pressure or voltage that can be obtained from any combination of these metals, is about three volts, whereas the current capacity is limited only by the size of the cell.

Pawnbrokers Helped By Radio

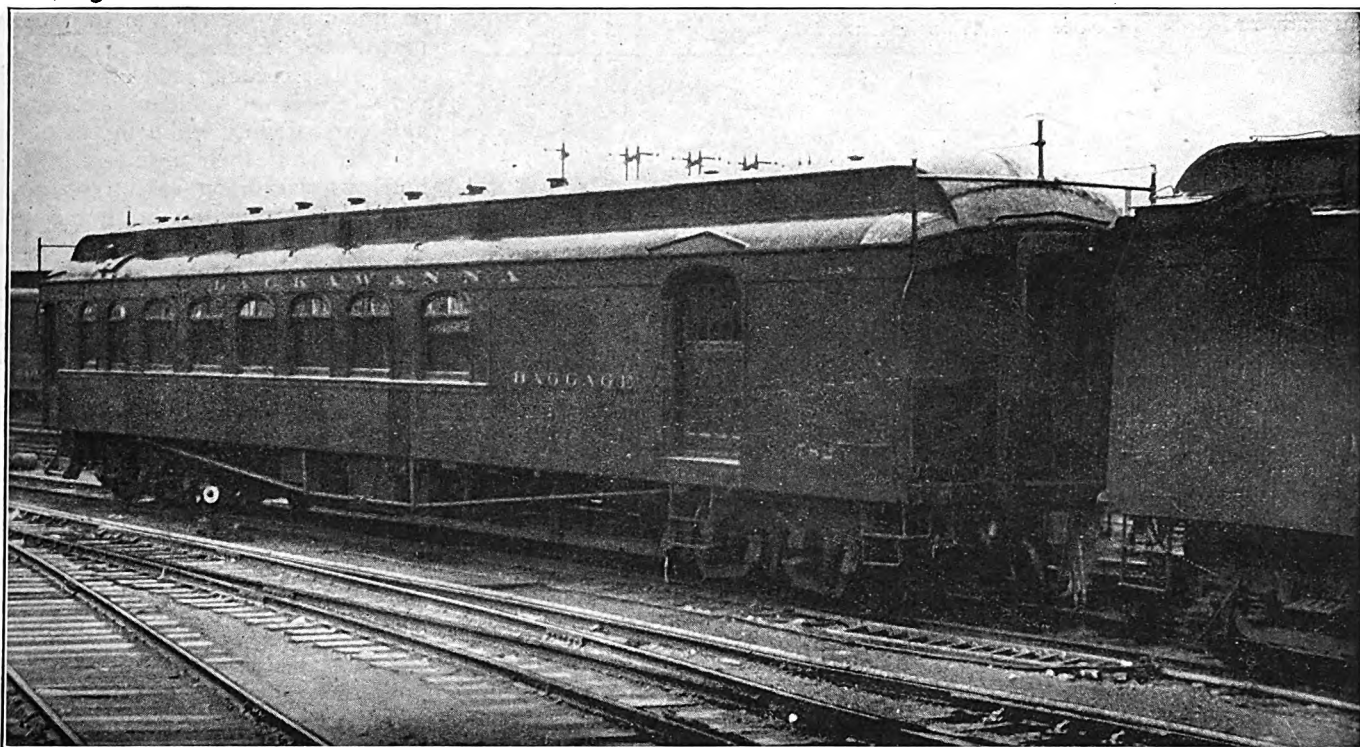
Uncle Nathan, who does a genteel business in loans on personal property on Sixth avenue, says the New York "Sun," removed three fly-specked cornets from his glittering window and lo and behold!—there appeared three radiophone receiving-sets. Uncle is broadcasting the news that the nation's latest craze has brought him in a new line of merchandise. If your bucket shop closes its doors with embarrassing suddenness, just sneak out the back way with junior's new radio outfit under your arm and exchange it for a ticket.

"There are styles in this business the game as any other." Uncle Nathan says. "While we always have the staple lines like diamond rings, pearl handled revolvers and sets of false teeth, we always have some feature line which happens to be in vogue.

"Last year it was saxophones. Everybody who was anybody had a saxophone. Lots of would-be saxophonists couldn't twist their fingers around all those keys and couldn't learn to play 'em. Others got dispossess notices. Still others needed the money. They all came to me.

"To-day it's these wireless-telephone exchanges. One man brought one in to-day because he couldn't get little Bobby to go to bed at night any more. Another one was disgusted because he couldn't hear San Francisco or Moscow from 135th Street. And so it goes."

Fast Train Gets Radio Successfully



(c. Underwood & Underwood.)

A car of the Delaware, Lackawanna & Western system equipped with aerials to catch radio messages. The experiment tried last Tuesday, was successful in every way and marks the beginning of a new and wonderful addition to travel.

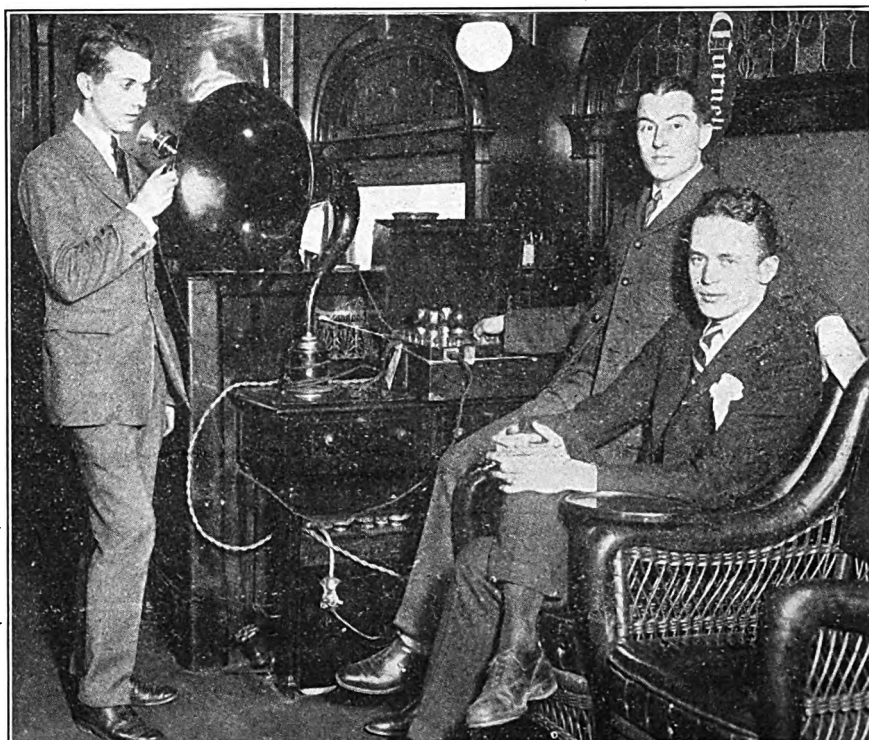
Music was successfully transmitted by radio to a moving train last Tuesday. It was heard clearly by several hundred students from Cornell University—students en route to New York City for their spring vacation. The train on which the successful experiment was made, was a special of the Delaware, Lackawanna & Western. It was the first time that radio sent out by a broadcasting station had been picked up by a moving train running on regular schedule.

A special receiving-set was set up in the buffet car—the same car that had been used by the Lackawanna system in its special attempt to catch radio messages while the Lackawanna Limited was making sixty-five miles an hour, and, also, while the train was going through a tunnel.

The first efforts to catch broadcast on Tuesday's train was when it pulled out of Ithaca. A musical program was being sent out from the Cornell station. This music was clearly heard. After the Cornell program, waves came into the train from the General Electric Company's station at Schenectady. This transmission, a special program of music, was received so well that the General Electric followed with a program made up of phonograph records. Before the train arrived at the Hoboken, New Jersey, terminal, it had picked up the broadcasting of the Newark station.

The Lackawanna experiments have been conducted by G. Donald Murray of 66 East 38th Street and David W. Richardson of Princeton, who were in charge of the amateur radio station at Princeton last year, when amateurs

attempted to send messages to Androssan, Scotland. Their station was one of about eight which succeeded in pushing through messages to Paul F. Godley, the amateur at Androssan on the Scottish coast.



(c. Keystone View Co.)

Radio equipment in the buffet car of the Lackawanna train which made the special test last Tuesday. In the photograph (left to right) are E. G. Sisson, Cornell University; D. W. Richardson, Princeton University; and G. Donald Murray, New York City, Radio experts.

Radio on Tugboats for Service and Entertainment



(c. Keystone View Co.)

Almost every tug in New York harbor is equipped with radio receiving apparatus in this manner. The radio service is not only used for receiving messages and guiding these busy craft through the fog, but is also a source of entertainment. No existence was so monotonous, at times, as that of a tug-boat crew, until radio became popular.



(c. Keystone View Co.)

In order to enliven the working hours of its crews, the New York Tug Boat Exchange has installed radio on a number of its craft. Instead of listening to the monotonous chug-chug-chug of the busy engines, the crews will be entertained with music and humorous stories—and, perhaps, a sermon once in a while. The photograph shows Frank Stevens, fireman, and Burton Smith, engineer, of the tug "Nautic" getting an earful of jazz from Newark, New Jersey.

wave; spark, interrupted or modulated continuous wave telegraphy, telephony, continuous wave telegraphy.

5.—That the amateur continue to be under the jurisdiction of the Department of Commerce.

6.—It is recommended that for the purpose of self-policing among the amateurs, deputy radio inspectors be elected from their number in each locality; that upon receipt of notice of such election the radio inspector in charge of the district in which such amateurs are located shall appoint the person chosen a deputy radio inspector, or for the sum of \$1 per year, if compensation is legally required.

Each amateur deputy-inspector shall endeavor to secure strict observance of the Radio Communication Laws and Regulations of the United States, also all local cooperative measures for minimizing aerial interferences.

Easy to Install Receiving Set

To install a receiving set is as easy as putting a graphophone in your living room, says A. Leonard Smith, Jr. in the New York "Times." If you dwell in New York you must first get permission from your landlord for the location of aerial wires or antenna on the roof. You will have to prove to him that their presence does not constitute a fire hazard, and that they are an ornament rather than a desecration of the chimney-studded scenery. Then go downtown and buy your apparatus. Remember that your antenna must be above the roof, and should, if you put up only one wire, be from 60 to 100 feet long.

Remember, also, that to cross a street in this city with a wire permission must be obtained from the Department of Water, Gas and Electricity. If you live where you can construct your wireless station on your own land, just fasten the aerial between your roof and a tree or pole. It should be carefully insulated from all supports.

Speak Distinctly

The varied literary programs sent out by the various broadcasting stations create one complaint—and this is due to the human element. It is claimed that many persons who speak into the transmitter do not enunciate with sufficient clearness, and run their words together in such a way as to be indistinctly heard. The way to speak into the transmitter is to keep the mouth close enough so the vibrations of the voice will be sent out uniformly, and to pronounce each word clearly.

Amateurs Ask to Be Made Inspectors

Secretary of Commerce Hoover has issued, by radio, the following recommendations of the Amateur Committee of the Radio Conference, to govern all persons using wireless:

1.—That the status of the amateur be established by law.

2.—That the limits of the wave-length band allocated to the amateur be specified in the law.

3.—That the wave length band allocated to the amateur be from 150 meters to 275 meters.

4.—That the Secretary of Commerce subdivide the amateur allocations into small or wave-length bands for the various classes of amateur-transmitting apparatus, at his discretion, but in the following order of wave-lengths, starting at the shortest

First Official Report of Government Control of Radiotelephony

Department of Commerce Issues Important Tentative Statement Describing Its Method of Standardizing the New Medium of Transmission

RESOLVED that the Conference on Radiotelephony recommend that the radio laws be amended so as to give to the Secretary of Commerce adequate legal authority for the effective control of the establishment of all radio transmitting stations except amateur, experimental and Government stations and of the operation of non-governmental radio transmitting stations.

Resolved that it is the sense of the Conference that radio communication is a public utility, and as such, should be regulated and controlled by the Federal Government in the public interest.

Resolved that the types of radio apparatus most effective in reducing interference should be made freely available to the public without restriction.

1. Allocation of Waves

A. It is recommended that waves for radiotelephony be allocated in bands according to the class of service as follows:

Note 10.—The wave band from above schedule are defined as follows: "BROADCASTING" signifies transmission to an unlimited number of receiving stations without charge at the receiving end. It includes:

(1)—*Government broadcasting* signifying broadcasting by departments of the Federal Government:

(2)—*Public broadcasting* signifying broadcasting from public institutions, including state governments, political subdivisions thereof, and universities and such others as may be licensed for the purpose of disseminating informational and educational service:

(3)—*Private broadcasting* signifying broadcasting by the owner of a station, as a communication company, a store, a newspaper, or such other private or public organization or person as may be licensed for the purpose of disseminating news, entertainment and other service; and

(4)—*Toll broadcasting* signifying broadcasting by a public service radio telephone company as a paid service.

Note 2.—A station carrying on two or more of the broadcasting services specified in classes 2, 3 and 4 must be licensed for each class of service.

Note 3.—Public broadcasting may temporarily be permitted to be done at the wave bands assigned to private and toll broadcasting, with a change to the assigned longer waves at a later date.

Note 4.—Municipal and state radio telephone service for public safety should in small cities be conducted by interrupting the broadcast service of classes 2, 3 or 4 in case of emergency. In large cities this service will ordinarily have its own station and will use the wave band, 275 to 285 meters, assigned to such service.

Note 5.—Private detective agencies desiring to operate radio telephone broadcasting service should be required to co-operate with municipal or state services in the use of the wave band, 275 to 285 meters, assigned to the latter service.

Note 6.—When transoceanic radio-telephone experiments are to be con-

ducted the Department of Commerce should endeavor to arrange with other countries for the use of the wave band 5,000 to 6,000 meters assigned for this purpose.

Note 7.—The wave band from 1,550 to 1,650 meters is for use of radiotelephone communication over natural barriers, but is not exclusive of other services.

Note 8.—The wave band from 700 to 750 meters may be used for Government and public broadcasting in parts of the country farther than 700 miles from the sea coast.

Note 9.—The restricted special amateur wave of 310 meters is for use by a limited number of inland stations and only where it is necessary to bridge large, sparsely populated areas or to overcome natural barriers.

Note 10.—The wave band from 2,850 to 3,000 meters may be used for

(Continued on next page)

RECOMMENDED WAVE ALLOCATION

	Wave- Length Meters	Frequency Kilocycles per Second
(1) Transoceanic radiotelephone experiments, non-exclusive	6,000	50
	5,000	60
(2) Fixed service radiotelephony, non-exclusive	3,300	90.9
	2,850	105.2
(3) Mobile radiotelephony, non-exclusive	2,650	113.2
	2,500	120
(4) Government broadcasting, non-exclusive	2,050	146
	1,850	162
(5) Fixed station radiotelephony, non-exclusive	1,650	181.8
	1,550	193.5
(6) Aircraft radiotelephony and telegraphy, exclusive	1,550	193.5
	1,500	200
(7) Government and public broadcasting	1,500	200
	1,050	285.7
(8) Radio beacons, exclusive	1,050	285.7
	950	316
(9) Aircraft radiotelephony and telegraphy, exclusive	950	316
	850	353
(10) Radio compass, exclusive	850	353
	750	400
(11) Government and public broadcasting, 700 miles inland	750	400
	700	428
(12) Mobile radiotelephony, non-exclusive	750	400
	650	462
(13) Mobile radiotelegraphy, exclusive	650	462
	525	572
(14) Aircraft radiotelephony and telegraphy, exclusive	525	572
	500	600
(15) Private and toll broadcasting, exclusive	435	690
	310	968
(16) Restricted special amateur radiotelegraphy, non-exclusive	310	968
(17) City and State public safety broadcasting, exclusive	285	1,052
	275	1,091
(18) Technical and training schools (shared with amateur)	275	1,091
	200	1,500
(19) Amateur (exclusive, 150 to 200 meters) (Shared with technical and training schools, 200 to 275 meters).	275	1,091
	150	2,000
(20) Reserved	below	150 above 2,000

(Continued from preceding page)
fixed service radiotelephony only, provided it does not interfere with service using continuous wave telegraphy.

Note 11.—No definite allocation shall be made in the wave band from 1,050 to 1,500 meters until after a conference between the Government Departments concerned.

Note 12.—Wave bands marked "non-exclusive" are available also for other types of transmission.

Note 13.—Wave bands not included in this table and those bands marked non-exclusive are available for radiotelegraphy, subject to regulation.

B.—It is recommended that the Secretary of Commerce assign a specific wave length to each radio telephone broadcasting station (except Government and amateur stations), this of course being within the band pertaining to the particular service of that station.

C.—It is recommended that the wave band assigned to amateurs, 150 to 275 meters, be divided into bands according to the method of transmission, damped wave stations being assigned the band of lowest wave lengths, interrupted or modulated continuous wave radio telegraph stations the next band, radiotelephone stations the next band, and finally unmodulated wave radiotelegraph stations the band of highest wave lengths. It is recommended that amateurs be permitted to carry on broadcasting within the wave length band assigned by the Secretary of Commerce to amateur radiotelephony.

D.—It is recommended that the present regulations governing experimental stations remain in effect.

E.—It is recommended that the establishment at any later date of any commercial transmitting stations having more than 1 kw. input to the antenna may, at the discretion of the Secretary of Commerce, be permitted within 25 land miles of a Government or commercial station or in regions where congestion of radio traffic shall warrant such prohibition.

2. Power Limitation, Geographical Distribution, and Hours of Operation of Broadcasting Stations

A.—It is recommended that the Secretary of Commerce assign to each radiotelephone broadcasting station a permissible power based on the normal range of the station, such normal ranges for the different classes of service to have the following average values, larger or smaller values being discretionary where conditions warrant:

Government broadcasting stations, 600 (land) miles.

Public broadcasting stations, 250 miles.

Private and toll broadcasting stations, 50 miles.

The Bureau of Standards of the Department of Commerce, should make a study of the relation between the normal reliable range of a station and the antenna power on the basis of the use of good available receiving apparatus. It is recognized that this relation may change with the development of the radio art.)

B.—It is recommended that the same wave (or overlapping wave bands) not be assigned to stations within the following distances from one another, except that these distances may be lowered if the normal ranges of the stations are correspondingly lowered.

For Government broadcasting stations, 1,500 miles.

For public broadcasting stations, 750 miles.

For private and toll broadcasting stations, 150 miles.

(The Bureau of Standards should make a study of the width of wave band (expressed in cycles per second) required for satisfactory radio telephony. It is recognized that this width depends on the methods of transmission and reception employed.)

C.—It is recommended that the Secretary of Commerce cause an immediate study to be made of the best geographical distribution of broadcasting stations with the view of attaining the best service with a minimum of interference. A chart has been prepared showing an ideal distribution of broadcasting stations under various assumed conditions as to number of available wave bands and ratio of distance between stations having the same wave length to normal range of the stations.

D.—It is recommended that in cases where congestion of radiotelephone broadcasting traffic exists, or threatens to exist, the Secretary of Commerce assign suitable hours of operation to existing or proposed private and toll broadcasting stations.

3. Considerations to be Followed in Granting Licenses

A.—It is recommended that in the case of conflict between communication services first consideration be given to the public not reached, or not so readily reached, by other communication services.

B.—Subject to public interest and to the reasonable requirements of each type of service the order of priority of the services shall be Government, Public, Private, Toll.

C.—It is recommended that the degree of public interest attaching to a

private or toll broadcasting service be considered in determining its priority in the granting of licenses, in the assignment of waves, and in the assignment of permissible power, within the general regulations for these classes of service.

It is recommended that toll broadcasting service be permitted to develop naturally under close observation, with the understanding that its character, quality and value to the public will be considered in determining its privileges under future regulations.

E.—It is recommended that direct advertising in radio broadcasting service be not permitted and that indirect advertising be limited to a statement of the name of the concern responsible for the matter broadcast—subject to such regulations as the Secretary of Commerce may impose.

F.—It is recommended that when all available wave bands in any geographical region are already assigned, no further licenses for broadcasting be granted in that region until cause arises for the revocation of existing licenses.

G.—It is recommended that private or toll broadcasting stations transmitting time signals shall transmit only official time signals and with authorization from and under conditions approved by the Secretary of Commerce.

H.—It is recommended that the transmission of signals of such character or wave length as to deliberately interfere with the reception of official time signals constitutes grounds for the revocation of the transmitting license.

It is recommended that license requirements for the operator of a radio telephone transmitting station include a knowledge of the International Morse Code, sufficient to receive at a rate of not less than 10 words per minute.

4. Technical Methods for the Reduction of Interference

A.—It is recommended that the Secretary at his discretion prohibit at any time the use of existing radio transmitting apparatus and methods which result in unnecessary interference, provided that such action should not be taken unless more satisfactory apparatus and methods are commercially available at reasonable prices and until an adequate time interval is allowed for the substitution of the more satisfactory apparatus.

B.—It is recommended that the Secretary of Commerce at his discretion prohibit at any time the use of existing radio receiving apparatus which cause the radiation of energy,

provided that such action should not be taken unless more satisfactory apparatus and methods are commercially available at reasonable prices and until an adequate time interval is allowed for the substitution of the more satisfactory apparatus.

C.—It is recommended that the Bureau of Standards make a study of the technical methods for the reduction of interference, with a view to publishing their findings, giving special attention to the following:

(1) The reduction of the rate of building up (increment) of oscillations in radiating systems. (This rapid building up of oscillations occurs in damped wave an interrupted continuous-wave transmitters, and may, of course, be eliminated by the substitution of other types of transmitter. It may, however, be reduced in these types by proper circuit arrangements.)

(2) The reduction of harmonics in continuous wave transmitters and of irregularities of oscillation ("mush" in arc transmitters and "swinging" of the frequency in all types of continuous wave transmitters not employing a master oscillator).

(3) The comparison of the variable amplitude method with the variable frequency method of continuous wave telegraphy.

(4) The preferable methods of telephone modulation to avoid changes in the frequency of oscillation.

(5) The proper circuit arrangements of regenerative (including oscillating) receivers to avoid radiation of energy (as by the use of a radio-frequency amplifier with an untuned antenna or with a coil aerial.)

(6) The use of highly selective receiving apparatus, including a list of approved forms.

(7) The use of receiving coil aeriels instead of antennas, with special reference to high selectivity.

(8) The reduction of interference with radio communication of other electrical processes, such as the operation of X-ray apparatus and electrical precipitation.

(9) The study and standardization of wave meters.

5. Recommendations of the Committee on Nomenclature

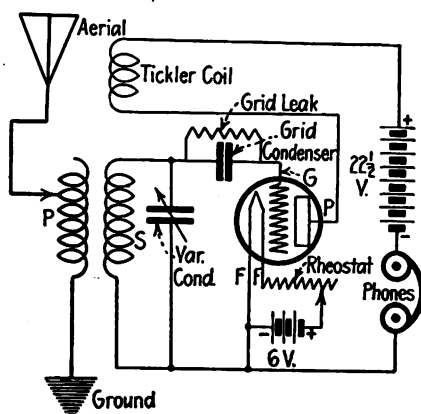
1. In place of the word "Wireless" and names derived from it, use the prefix "Radio;" Radio Telegraphy, Radio Telephony.

2. Instead of "Statics" or "X's," use "Atmospheric Disturbances" or "Atmospherics."

3. Disturbances produced by other Stations to be designated as "Interference."

Tickler Coil for Regenerative Receiver

Another method of using the regenerative type of receiver is described in the diagram marked Fig. 1, where a tickler coil is connected in series with the plate circuit, being placed in an inductive relation to the high potential end of the secondary (marked S). The primary (P) may have as many turns to the wave



Regenerative receiver employing a tickler coil in the plate circuit.

length as desired, with the secondary (S) in proportion; whereas the tickler coil should have about three-fourths the value of the secondary. The coupling will become critical and, in turn, the regenerative connection will amplify the incoming signal many times. For the reception of undamped waves, close coupling is necessary.

4. For the generic title of the vacuum tube, of any number of electrodes, and in any of its recognized modes of operation, use "Electron Tube."

For the specific title of the ordinary three-electrode tube, use "Triode."

For the title of a triode employed in one of its regular modes, use "Rectifier triode," "Amplifier triode," "Generator triode."

5. In describing coupling of high frequency circuits, use "Resistance Coupling," "Inductive Coupling" (by self-inductance or mutual inductance), "Capacity Coupling."

6. For the generic title for a system of conductors for radiating or absorbing radio waves, use "Aerial." For an open circuit aerial use "Antenna."

For a closed circuit aerial use "Coil."

7. For a receiving arrangement in which beats are produced by a separate local oscillator, use "Heterodyne."

For a receiving arrangement in which the same electron tube is used for generating oscillations and detecting, use "Self Netto."

8. Classification of waves emitted by Radio transmitters.

Type A.—Continuous Waves.

Waves that in the permanent state are periodic and such that their successive amplitudes of oscillations are identical.

Type A1.—Manipulated Continuous Waves.

Continuous waves of which the amplitude or frequency vary under the action of hand telegraphic manipulation.

Type A2.—Continuous Waves with audible frequency modulation.

Continuous waves of which the amplitude or the frequency vary according to a periodic law of audible frequency. This is commonly referred to as ICW method of transmission.

Type A3.—Continuous waves with speech modulation.

Continuous waves of which the amplitude or the frequency vary in accordance with speech vibrations (radio telephony).

Type L.—Damped Waves.

Waves composed of successive trains in which the amplitude of the oscillations after having reached a maximum decreases gradually. This refers to waves from spark transmitters or other types of transmitters having a characteristic decrement similar to spark transmitters.

Note 1. If in continuous wave transmitters the rectified plate voltage is not substantially constant direct voltage the station should be classed under Type A2.

Note 2. In ICW transmitting stations if the variation in the wave length or frequency of the transmitted wave is effected in a gradual way (sinusoidally) the station should be classed under Type A2. If the variation in frequency or amplitude is abrupt, (chopper method) it should be classed in Type B.

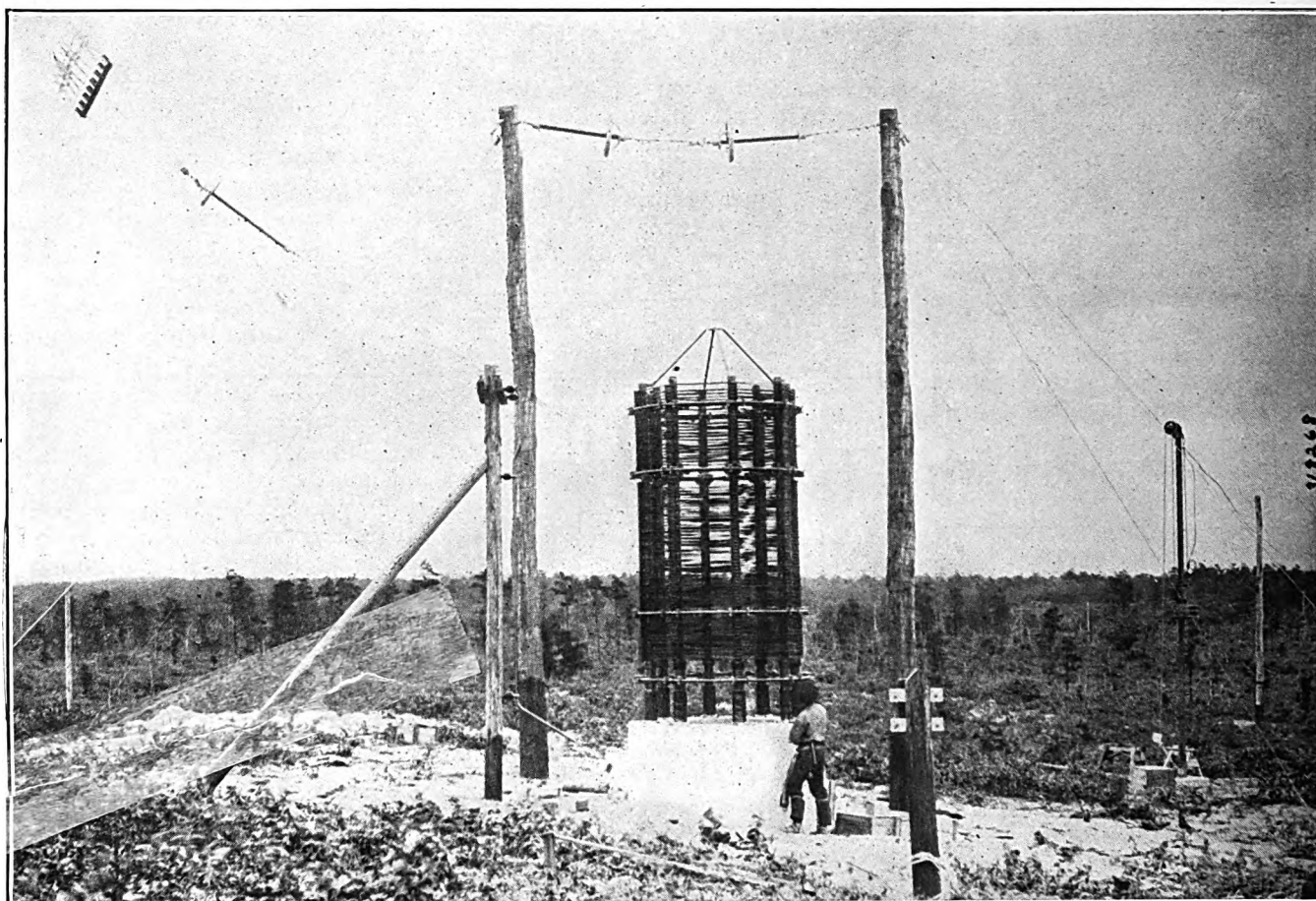
In order to differentiate between the amateur and the experimenter the following definitions are suggested for consideration:

The amateur is one who operates a radio station transmitting, receiving, or both, in a professional way, merely for personal interest or in connection with an organization of like interest.

An experimenter is one who operates a transmitting or receiving station, or both, for exclusively technical or scientific investigations.

Note:—Further recommendations on nomenclature to be added later.

World's Largest Transmitter and Tuner



(c. Underwood & Underwood.)

This is the giant transformer and tuner of the world's largest "radio central," the new plant of the Radio Corporation of America, at Port Jefferson, Long Island, New York. This station can receive and transmit messages to all parts of the world. This station is now in active operation.

Laws Governing Radio Traffic

EVERY person engaged in the handling of radio traffic should be thoroughly familiar with the radio-communication laws of the United States and the International Radiotelegraphic Convention. These laws provide that in order to operate a radio-transmitting station, both a *station* license, and an *operator* license must be secured. The law provides penalties for the operation of a transmitting station without proper licenses.

A station used only for receiving does not require a station license. Operators of stations used only for receiving do not require operator's licenses, but must maintain secrecy in regard to message heard.

Provision is now made for eight classes of land stations, as follows:

- 1.—Public-service stations, general.
- 2.—Public-service stations, limited.
- 3.—Limited commercial stations.
- 4.—Experiment stations.

5.—Technical and training-school stations.

6.—Special amateur stations.

7.—General Amateur Stations.

8.—Restricted amateur stations.

Station licenses for classes 4, 5, and 6, are issued only under exceptional circumstances. General amateur stations are restricted to a transmitting wave length not exceeding 200 meters and a transformer input not exceeding 1 kilowatt.

Restricted amateur stations are amateur stations located within five nautical miles of a naval or military station, and are restricted to a wave length not exceeding 200 meters and to a transformer input not exceeding one-half kilowatt.

The radio-communication laws above mentioned are issued in a pamphlet, "Radio Communication Laws of the United States." Copies may be purchased, at 15 cents each, from the Superintendent of Docu-

ments, Government Printing Office, Washington, D. C.

Radio Now Part of Vaudeville Program

The radiophone has been added to the regular bill of vaudeville and pictures at the Palace Theater, Peoria, Illinois. The idea is credited to Richard Robertson, Chicago representative of the Ascher Brothers, managers of the Palace. Mr. Robertson and Professor Shalkhauser of the Bradley Polytechnic Institute, a radio authority, worked for weeks to develop the feature. The management intends to utilize the radiophone to supply its audiences with news features such as baseball reports and election returns as well as musical selections. The Messrs. Ascher are considering throwing their theater open to the public on Sundays, to hear sermons and lectures. The roof of the Palace is installed with an 80-foot aerial.

Your Storage Battery

"**N**OW, let's check over these things," said the radio dealer, "to see if you have everything you need. There's the tuning cabinet, the phones, the vacuum-tube detector panel; here's the tube that goes in that socket, there is the aerial stuff—in that package—and the 'B' batteries in this one. That just about fixes you up. But, no! Wait a minute. You'll need a storage battery like the one in the window."

"What's the idea of the storage battery?" naturally asks the purchaser as he takes in the bulk of the case with a swift glance.

"That's pretty important," replies the dealer. "You need one of those to light the filament of the tube. The 'B' batteries supply the plate-voltage and current, but you can't use dry batteries on the filament because it requires too much current. But don't let that worry you," the dealer continues as he notes the perplexed expression on the radio bug's face. "Once you've bought a storage battery you are finished with that end of the set. You'll have to have it recharged once a month or, perhaps, not so often; but that's all. Just put it under the table and forget about it. These storage batteries are the kind they use on submarines, and they'll stand any sort of treatment."

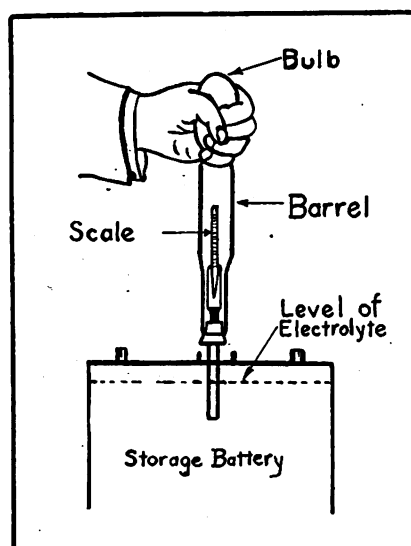
And, true to the free advice, the wireless man goes on home hooks up his set, slides the storage battery under the table and promptly forgets about it. He shouldn't tinker with it, but he should give it the same amount of supervision that he gives his tubes. Storage batteries, as a rule, are well and strongly built—but they will not stand "any sort of treatment." A knowledge of the battery and what happens inside will save many dollars later on.

A storage battery is not in strict terms a storage cell for electricity. It is more truthfully a storage for chemical energy. When the new battery is charged, the lead composition is changed by electrolysis into other lead compositions made up of oxides and sulphates of lead. The chemical action is so complicated that even text books on storage batteries do not state with certainty what the elements are. However, that need not disturb us here as our interest is in the external operations only.

A storage battery is made up of a series of perforated lead-plates each one insulated from its neighbor. Half of the plates are called *positive*, and

What It Is How It Works How to Care for It

By E. L. Bragdon



The condition of a storage battery is determined by the specific gravity of the acid solution. An instrument, called the "hydrometer," is used, as shown in this diagram, to test density of specific gravity.

are connected together; the other half are called *negative*, and are also connected as one unit. In building a battery, the positive and negative plates are alternated, first a positive and then a negative and so on.

It is not difficult to see that the battery would not be able to function without some substance between the sets of plates. This substance is called the *electrolyte* and consists of a solution of chemically pure sulphuric acid and distilled water in the proportion of one part acid to four parts water. Enough of this solution is added to the battery to come just over the top edge of the plates.

When the storage battery is charged with electricity; a chemical action takes place which carries minute particles of lead from one plate, mixes it with the acid, and deposits the resulting compound on the opposite plate. So sensitive is the chemical solution in the battery to the amount of electrical energy which it has converted, that the best indication of the condition of the battery is a measurement of the *heaviness* of the liquid by means of a floating indicator called a "hydrometer."

The hydrometer used in storage-battery work consists of a float with accurate graduations enclosed in a glass tube open at one end and with a rubber syringe at the other. By pressing the rubber bulb, the air is driven out of the tube and when it is released the electrolyte enters. The float will sink into the liquid a distance depending on its *heaviness* or specific gravity. When a storage battery is fully charged, the hydrometer will read about 1280; while a battery is considered fully discharged when the reading is 1225. To obtain the longest life possible from a storage battery of the lead-acid type, the cells should never be discharged beyond the three-quarter's point, when the hydrometer will read 1240.

Storage batteries are graded according to their capacity in ampere-hours. One ampere of current flowing for one hour is called an ampere-hour.

Ten amperes flowing for one hour, or one ampere flowing for ten hours, equals ten ampere-hours. Thus a storage battery with a 60 ampere-hour capacity will deliver one ampere continuously for 60 hours to its full discharge point. However, as mentioned in a preceding paragraph, this is a proceeding that should never be countenanced. Three-quarter's discharge is the reasonable limit.

When used with a vacuum tube receiving set a battery will give continuous service depending on the number of tubes and the hours they are operated. Vacuum tubes require about one ampere of filament current. If the set comprises a detector and two-amplifying tubes the current demand will be three amperes. On this basis, a 60 ampere-hour storage battery will give service for about 15 hours continuous operation.

The voltage of a storage battery is nearly constant. A voltmeter applied to a fully charged battery will register about 2 volts per cell. When discharging, the battery voltage will average about 1.95 per cell unless the load is more than normal, under which conditions the voltage may drop as low as 1.75. If the battery is allowed to discharge well beyond the three-quarter's point the voltage will drop off sharply. This is the cause of much trouble on the part of beginners who seem to think that a battery, when once charged, is good for normal voltage up to the very minute when the last ampere in the battery has given out.

How Uncle Sam Has Tackled the Transmission Problem

PERSONS contemplating the installation of radio stations which are expected to maintain reliable radio-communication at all times, particularly radiotelephony, must bear in mind that radio communication is often subject to serious interference from atmospheric electric-disturbances, which are particularly serious during summer. Other difficulties in transmission may also exist. Information regarding the actual operating-conditions in a given locality should be obtained, whenever possible, from the operators of the nearest radio stations.

If a transmitting station radiates more than one wave length, the energy in no one of the lesser waves shall exceed ten per cent. of the energy in the principal wave.

The logarithmic decrement per complete oscillation must not exceed two tenths.

Amateur station licenses contain the following clause: "This station is not licensed to broadcast weather reports, market reports, music, concerts, speeches, news, or similar information or entertainment."

Operators' licenses are divided into the following classes: commercial extra grade; commercial temporary permit; experiment and instruction grade; amateur first grade; and amateur second grade. In order to

obtain an operator's license of any grade, it is necessary to pass an examination, showing certain qualifications. For the amateur licenses, an operator must be sufficiently familiar with the International Morse Code to receive at a speed of at least ten words per minute.

Both station licenses and operators' licenses are issued by the Bureau of Navigation of the Department of Commerce, Washington, D. C. The United States is divided into nine radio districts. Each district has a radio inspector, who has charge of the issuing of both station licenses and operators' licenses in his district. Application for either kind of license should be addressed to the radio inspector of the district in which the station is located. If this is not known, to the Bureau of Navigation, Department of Commerce, Washington, D. C.

The offices of the radio inspectors are located as follows:

First District, Radio Inspector, Custom House, Boston, Mass.

Second District, Radio Inspector, Custom House, New York, N. Y.

Third District, Radio Inspector, Custom House, Baltimore, Md.

Fourth District, Radio Inspector, Custom House, Baltimore, Md.

Fifth District, Radio Inspector, Custom House, New Orleans, La.

Sixth District, Radio Inspector, Custom House, San Francisco, Cal.

Seventh District, Radio Inspector, 2301 L. C. Smith Bldg., Seattle, Wash.

Eighth District, Radio Inspector, Federal Building, Detroit, Mich.

Ninth District, Radio Inspector, Federal Building, Chicago, Ill.

The laws regulating the operation of private radio stations in Canada are in several respects quite different from those in force in the United States. For instance, a station which is used only for receiving must have a station license, but is not restricted as to the length of its antenna. Every person operating any kind of a radio station, in Canada, for either receiving or transmitting, must have a "Certificate of Proficiency," or operator's license. A "Certificate of Proficiency" can not be issued to a person who is not a British subject.

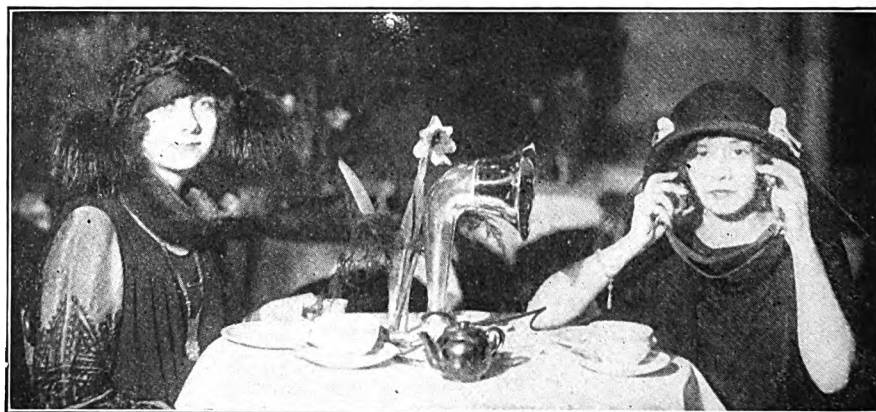
Amateur experimental stations used for transmitting are restricted to wave lengths of 50, 100, 150 or 200 meters, according to their distance from commercial land stations or routes of navigation. Stations located within five miles of a commercial coast or land station or a route of navigation can not use a transmitting wave length greater than 50 meters. Changes in the Canadian regulations are now under the consideration of the government.

Will We Hear the Ants?

Thomas A. Edison recently expressed a feeling, or perhaps it was a hope, that with the development of radiotelephony we humans might be able to "hear ants talk," says the New York "Tribune." William Beebe and other naturalists who have studied these highly social forms of life, report jungle conclaves that indicate strongly that these tiny creatures employ some means of long distance communication. Is it wireless?

What would Henri Fabre have said of such an idea? Man has a poor memory and is likely to forget that the word antennae meant the "feelers" of an insect long before it was adopted as a part of the nomenclature of wireless telegraphy. Science has established that many forms of life develop electric energy. Given this and antenna, why should not insects broadcast news of food or amorous desires?

Radio Enlivens Afternoon Tea

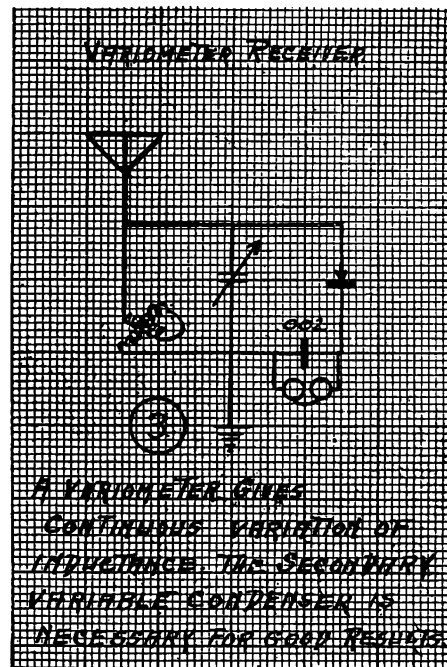
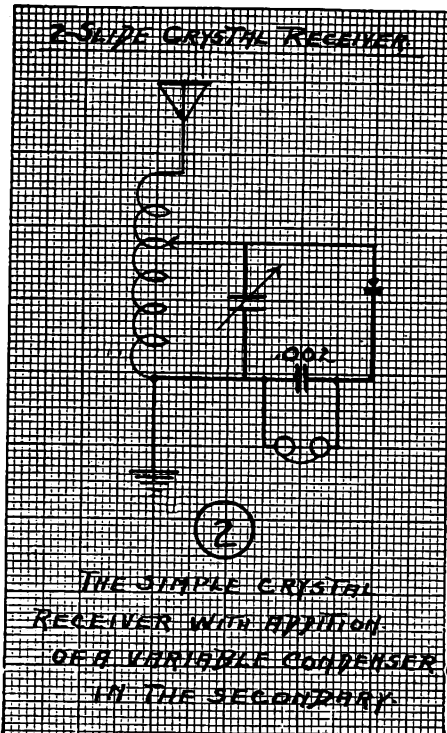


(c. Keystone View Co.)

Afternoon tea in several big New York City Hotels is now enlivened by the addition of radio messages. There is the regular orchestra, of course; but during the intermissions, the fair patrons may have their entertainment diversified by the latest and most popular method of hearing things. At the recent exposition of the Travel Show, at the Grand Central Palace, as shown in the pictures, the tea tables were equipped with lead-in wires and the necessary apparatus for listening in.

Simple Circuit Receivers

A two-slide crystal receiver is shown here in Fig. 2, comprising a two-slide tuner. Shunted to the secondary of the tuner is a .0005 variable-condenser, while in series with the secondary circuit we place the crystal detector and a .002 fixed-condenser while around this .002 fixed-conden-



ser is placed the head telephones. Fig. 3 shows the same circuit with one exception: In place of a tuner we use a variometer, which is a simple and easy hook-up. With the aid of a variometer and the secondary condenser we will have a continuous variation of inductance which result in better tuning.

Direct from Paris! Radio on Parasol



(c. Photograms, N. Y.)

A young Parisian inventor hopes to enable young ladies promenading the fashionable boulevards, to enjoy the strains of the orchestral music sent out by the Eiffel Tower wireless, and other aerial messages. The inventor has placed the radio antenna in a parasol, so that she who carries it has only to raise her parasol and listen in. The young lady in the photo is Isabelle Bennett.

The Problem of Policing the Ether

NOW that radio broadcasting has gripped the enthusiasm of the general public, policing the ether is a pertinent problem. The big-wave trespasser is a menace to the amateur and it is apparent that only by close co-operation between amateur, radio operators and the Government officials, can the greatest benefit be secured from the air.

George E. Burghard, President of the Radio Club of America, in an interview in the New York "Tribune," has spoken with directness on this subject:

"The majority of amateurs," said Mr. Burghard, "comply faithfully with the laws governing their activities. There are a few, however, who, either through ignorance or maliciousness, deliberately exceed the wave length allowed them for transmission, and by doing so jam up the ether and spoil things for everybody.

"Up to the present time there has not been a sufficient force of government officials to go after the transgressors. There is one solution of the situation, and that is complete co-operation between the body of responsible amateurs and the radio inspectors.

"It does not matter how much in sympathy with the American boy Secretary Hoover may be, he cannot override the force of public opinion, and if the general public ever becomes antagonistic toward the amateur the government officials will have to take action.

"Therefore, it seems to me that the radio clubs should take it upon them selves to see that the radio laws are strictly complied with so far as their own particular members are concerned. Just how they should go about this is a difficult question to answer, because, while there should be co-operation to bring about the fullest possible efficiency in use of the ether, nevertheless the responsible amateur should not be suppressed.

"Every amateur should train himself to report every infringement of the wave-length law which he observes. He should not feel that he is 'snitching' or telling tales. He should do it in order to protect himself and his fellow amateurs who are obeying the laws, and who might suffer from the acts of the man who is maliciously flouting all regulations and spoiling things for everybody."

The Radio Primer

The A. B. C. of Radio for the Novice Who Wants His Facts Put Plainly and Tersely

Radio Terms at a Glance

ETHER. (Pronounced *ee-ther*). A compressible substance that fills the space between all molecules of all material, including air, gas, and water.

METER. (*mee-ter*). A unit of distance. Equal to 39.37 inches. The metrical system of measurement of which the meter is one unit is based on the decimal, that is, it is denoted always in amounts of tens, hundreds, thousands, etc.

VACUUM. (*vak-yoom*). A space from which all air has been removed. A perfect vacuum has never been attained artificially although scientists have succeeded in removing from a container all but a millionth part of the air.

ANTENNA. (*an-ten-er*). A term used by Hertz, the radio pioneer to denote the wires hoisted into the air

to pick up radio waves. Antenna means "feelers" which explains his use of the word.

POSITIVE POLE. (*pos-e-tiv*). One side of an electric circuit. Usually marked by a plus (+) sign. The positive pole of a storage battery is frequently painted red.

NEGATIVE POLE. (*neg-er-tive*). The side of an electric circuit opposite to the positive. Denoted by a (—) sign.

WAVE LENGTH. The distance from the crest of one wave to the crest of the next. Always computed in meters.

FREQUENCY. (*free-kwent-see*). The number of times an action occurs in a unit of time usually taken as a second.

VACUUM TUBE. A incandescent

bulb from which the air has been removed and in which are placed three elements: filament grid and plate. Used to detect and magnify radio waves.

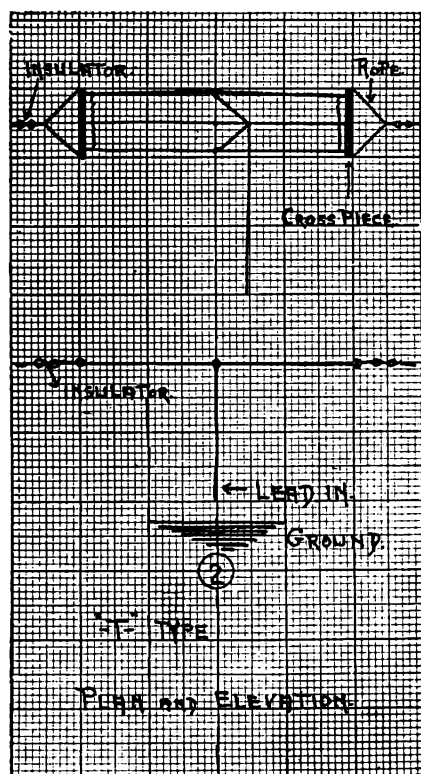
AMATEUR RADIO RELAY LEAGUE. A country wide organization of amateur wireless enthusiasts with headquarters at Hartford.

ATMOSPHERIC. (*at-mos-fear-ik*). Relating to the air surrounding the earth.

STATIC. (*stat-ik*). Minute electrical charges of high frequency and high voltage but with a duration of only an instant.

AERIAL. (*a-ree-l*). Same as antenna (see above).

LEAD-IN. (*lead-in*). The wire connecting the antenna with the receiving set.



An inverted "L" aerial which is used by many amateurs. In this case the lead-in wires are taken off the end. The graph shows the construction with plan and elevation in view.

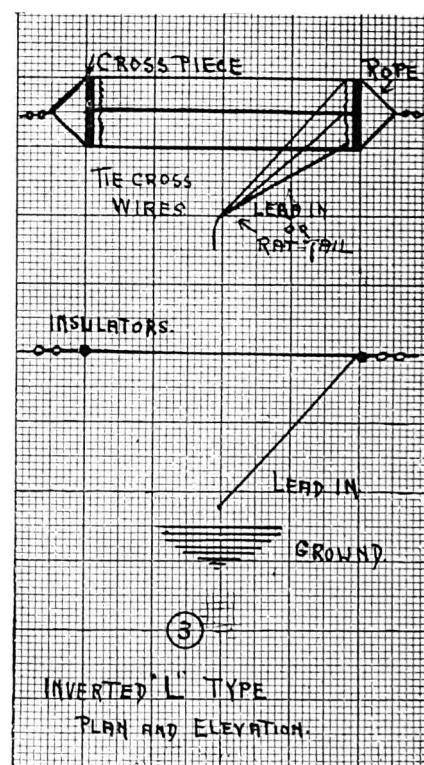
Points for Beginners

Just a few valuable points to the radio enthusiast who is contemplating constructing his own receiver. These may be of advantage also to anyone about to purchase parts for assembly. One imagines that all that is necessary to connect up instruments according to the diagram accompanying the equipment, is to hook on the aerial and ground, then listen to the broadcast. This is not so easy as it seems.

When constructing a set, by all means, cross all wires, when necessary, at right angles. Solder all connections, keeping all leads as short as possible. By closely following this information, better results will be obtained.

Types of Aerials

The most common type of aerials in use are the "T" and the inverted "L". Solid or stranded copper wire is used by some amateurs, while others prefer silicon bronze or phosphorus bronze. A single wire of 7 strands of No. 18 or 20 would be suitable to buy. Hard drawn or aluminum wire may be used. Galvanized iron or steel wire has been used but the resistance losses are rather high.



A "T" Type aerial which is generally used where it is more convenient to take the lead-in wires off the centre of the flat top rather than on the end. Graph shows plan and elevation.

What Makes Radio Possible

By Edward Linwood

AN unknown, unseen, theoretical substance called *ether* makes possible the enjoyment of radiotelephone concerts. Ether is the name given to a "something" that fills all the tiny spaces between the molecules of air, space, water, and all other earthly materials. This has been proved by comparing the action of radio waves with those of light. Both have the same characteristics with the exception that the length of light waves is so slight as to be difficult of measurement while radio waves range between 75 meters (244 feet) and 25,000 meters (15½ miles) in length. It has been shown in the laboratory that light waves will pass through almost a perfect vacuum without being halted or having its path changed. Therefore this ether must be present throughout the universe even beyond the most distant stars.

* * *

How does the ether carry radio waves?

If a whip with a long flexible lash is snapped with a quick movement, a wave will start near the handle and move steadily out to the very end of the lash. Only the wave has moved. The position of the whip has, in the main, remained stationary. It is the same with radio waves. When the transmitting station sends an electric current from the spark gap, or similar means, out to the antenna the ether can be considered as being struck suddenly. The action is the same as when a rock is hurled into the water. Waves form near the antenna and dart off into space in every-widening circles. The ether does not move; for it would be impossible for any body of matter to travel through space as fast as 186,000 miles a second. The impact is merely communicated by means of the ether. So sensitive is this substance that when an electric spark is hurled into it, its effect can be felt one-seventh of a second later, after it has traveled completely around the world.

* * *

Why is it, then, that wireless signals do not continue traveling forever?

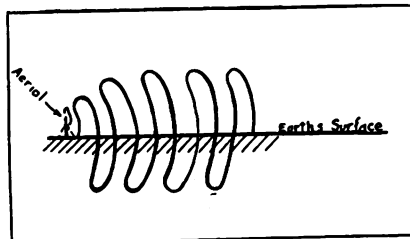
If the earth were flat and without trees, houses or wires, and if the air did not change its character by day and night there is no reason why the waves should not continue indefinitely. But every tree is a miniature antenna which picks up some of the thereal

energy; houses and wires afford an easy path into the earth, and air is affected by the sun's rays to such an extent that much of the initial energy of the radio waves is neutralized.

* * *

If radio waves use the ether of the air, why is the earth necessary?

As everyone knows, electricity must have a *positive* and *negative* pole before it can be made to travel from one point to another. Electric currents always travel from a positive pole to a negative pole. If a radio wave of only one pole (either positive or negative) were to be sent to the top of an antenna, there would be no corresponding negative pole to attract it on. Therefore, to secure a movement of the waves, the earth must be used as the other pole. The sketch shows how the waves travel. Part of the wave is above the earth's crust while the corresponding half is beneath it.

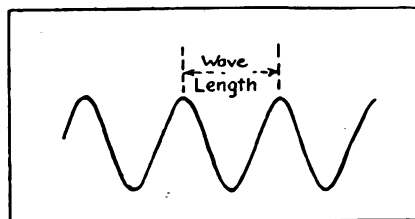


Showing the wave length measurement of a continuous wave.

* * *

What is meant by wave length?

A radio wave is considered to have the shape shown in the illustration. The length of a wave is figured as being the distance from the top (crest) of one wave to the top of the next.



Hoops of the electrostatic component of an electric wave motion.

* * *

How is the wave length computed?

The wave length is equal to the speed of the waves divided by the number of times they occur per second, called the "frequency." The frequency is determined by the num-

ber of spark discharges that take place in the case of a spark station, or by the number of vibrations, or oscillations in a vacuum tube sending set. Thus, broadcasting waves having a length of 360 meters must have a frequency of 833,333 per second. This figure is obtained by dividing the velocity of radio waves—300,000,000 meters a second—by 360 which is the length of one wave.

* * *

What does the wave length have to do with the sending and receiving distance?

The best answer to this question is the recent trans-Atlantic achievement of the Amateur Radio Relay League by which it was proved that a short wave can travel great distances. Wave length does have a bearing on sending distance, but the latter is not directly dependent upon it. The big stations use the longer waves because they are least affected by atmospheric disturbances and because it would be more difficult and more expensive to generate the high frequencies of short waves while using high power.

* * *

Why do transmitting stations use antenna's of many wires while receiving stations use but one long wire?

The problem at the sending station is to shoot out just as much electrical energy as can possibly be handled. The additional wires provide this capacity. At the receiving station it is not advisable to try and pick up a great amount of the transmitted energy. It is better to arrange an aerial in the most economical manner and then to use the energy as to get the most from it. The receiving station is also bothered with interfering impulses either from other stations or from waves generated in the air by natural means. A multi-wire aerial picks up more of both kinds of waves and makes it necessary to lose much of the signal energy in order to get rid of the interfering energy.

* * *

What is Static?

In plain words, static is a miniature thunderbolt. The action of droplets of moisture at different temperatures creates minute electric charges. If enough of these collect to raise the voltage so high that they can span the distance, they jump to the earth or to other clouds. This is called to the wires and from the wires pass

(Continued on next page)

14,000 Amateur Stations

There are 14,000 amateur transmitting stations operated by enthusiastic experimenters and capable of short-distance broadcasting. Numerous Government stations broadcast official business, but also can be used in distributing speeches or messages to the country at large.

Radio devotees are taking comfort from their confidence in the good judgment of Mr. Hoover, his ability to recognize the cultural and educational possibilities of the radiophone, and his disposition toward human kindness, says the "Bulletin," (Providence, R. I.)

The matter of needed regulation is in the hands of the Department of Commerce, the Department of Commerce is in the hands of Mr. Hoover, and Mr. Hoover is controlled by sound sense and good-will.

Books for Amateurs

E. E. Bucher. "Practical Wireless Telegraphy." 1918. Wireless Press, Inc., New York.

E. E. Bucher. "Wireless Experimenter's Manual." 1920. Wireless Press, Inc., New York.

Charles B. Hayward. "How to Become a Wireless Operator." 1918. American Technical Society, Chicago.

"Robinson's Manual of Radio Telegraphy and Telephony." 1920. United States Naval Institute, Annapolis, Md.

"The Admiralty Manual of Wireless Telegraphy." 1920. Published by His Majesty's Stationery Office, London, Eng.

M. B. Sleeper. "Design Data for Radio Transmitters and Receivers." 1920. Norman W. Henley Publishing Co., 2 West 45th St., New York.

(Continued from preceding page)

down the lead-in to the receiving-set. If the charges form near an aerial, they pass down to the set.

* * *

Is it possible to overcome static?

It has already been done on a small scale but the method is expensive and can be applied only to the larger stations. The cure for static is based on a theory that static waves travel vertically, whereas radio waves move horizontally. By placing receiving antenna a long distance apart, and the receiving set half way between them, the static waves strike both aërials at the same time while the radio waves reach the aerial nearest the sending station first and do not register at the second aerial until a very short but nevertheless appreciable time later on. Special coils are arranged so that the static sounds from the two aerial "buck," or kill, each other, thus leaving the circuit clear for the signals.

An Amateur, to Get a License, Must Read Ten Words a Minute

INTERNATIONAL MORSE CODE AND CONVENTIONAL SIGNALS

1. A dash is equal to three dots.
2. The space between parts of the same letter is equal to one dot.
3. The space between two letters is equal to three dots.
4. The space between two words is equal to five dots.

A	Period
B	Semicolon
C	Comma
D	Colon
E	Interrogation
F	Exclamation point
G	Apostrophe
H	Hyphen
I	Bar indicating fraction
J	Parenthesis
K	Inverted commas
L	Underline
M	Double dash
N	Distress Call
O	Attention call to precede every transmission
P	General inquiry call
Q	From (de)
R	Invitation to transmit (go ahead)
S	Warning—high power
T	Question (please repeat after)—interrupting long messages
U	Wait
V	Break (Bk.) (double dash)
W	Understand
X	Error
Y	Received (O. K.)
Z	Position report (to precede all position messages)
Ä (German)	End of each message (cross)
Á or Å (Spanish-Scandinavian)	Transmission finished (end of work) (conclusion of correspondence)
CH (German-Spanish)	
É (French)	
Ñ (Spanish)	
Ö (German)	
Ü (German)	
1	
2	
3	
4	
5	
6	
7	
8	
9	
0	

In radiotelegraphy, signals are transmitted by dots and dashes arranged according to the "International Morse Code," sometimes called the "Continental Code." The International Morse Code is different from the American Code which is used on land lines in the United States. The International Morse Code is given in "Principles Underlying Radio Communication" in the books by Robinson, Robinson, and Hayward, and

also in the pamphlet, "Radio Communication Laws of the United States." The International Morse Code is also given on a small card (Form 773a) published by the Bureau of Navigation. A copy of this card may be procured, without charge, by applying to the Bureau of Navigation, Washington, D. C., or to any district radio inspectors. Beginners should learn with a regular telegraph key, battery and buzzer.

Answers to Our Readers

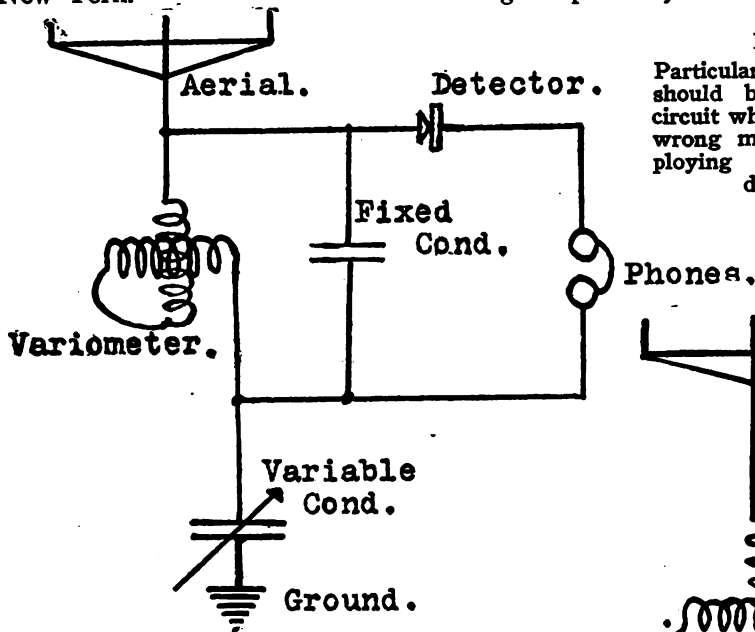
1.—Referring to tried-and-true receiver, described in No. 1 of RADIO WORLD, will this circuit tune sharply?

2.—If so, can I add more to coils (L3 and L4) to get a longer wave length? How much wire will I need to tune to 4,000 meters?—J. M., Woodhaven, N. Y.

1.—This being a regenerative receiver, there is no question that sharp tuning is available, if proper adjustment be made with L1, L2, C1, and C2. Then with the aid of L4 (tickler coil) good results will be obtained.

2.—In reply to your No. 2, we advise you to read pages 249 and 250 of "Wireless Experimenter's Manual", by E. Bucher. Page 174 will tell you the necessary wire needed for different wave-lengths.

A friend sent me a diagram (shown in Fig. 1) of a crystal hook-up and my book does not agree with it. What is the correct arrangement? C. M. S., New York.



The correct arrangement is shown in Figure 2.

It is the only correct one for the following reasons:

In your figure we find there is a "draining off" of the radio frequency signal thru the fixed condenser, thus depriving the crystal rectifier of a chance to do more work and provide a louder signal. Do not, however, be misled into thinking the crystal converts radio-frequency currents into audio-frequency currents, as some incorrectly advised writers state.

The very radio-frequency signal that does finally get to the detector to be heard in the telephone as soon as it is rectified is prevented

Radio World Will Help You Solve Your Problems

THE editors of RADIO WORLD will be glad to answer inquiries from readers. If you are experiencing any trouble with your receiving apparatus, write us. Tell us what your trouble is, what kind of apparatus you are using and any other facts that seem necessary. If you wish to install a receiving set and need advice, write us; but state whether you live in an apartment or a private house and your distance from the nearest broadcasting station. Questions of general interest will be fully answered in this department.

Inquiry Editor, RADIO WORLD,
1493 Broadway, New York City.

from reaching its full value by the high impedance due to the presence of the telephone. This is diminished in the proper arrangement by shunting the phone by the fixed condenser.

Fig. 1

Particular attention should be given this circuit which shows the wrong method of employing a fixed condenser.

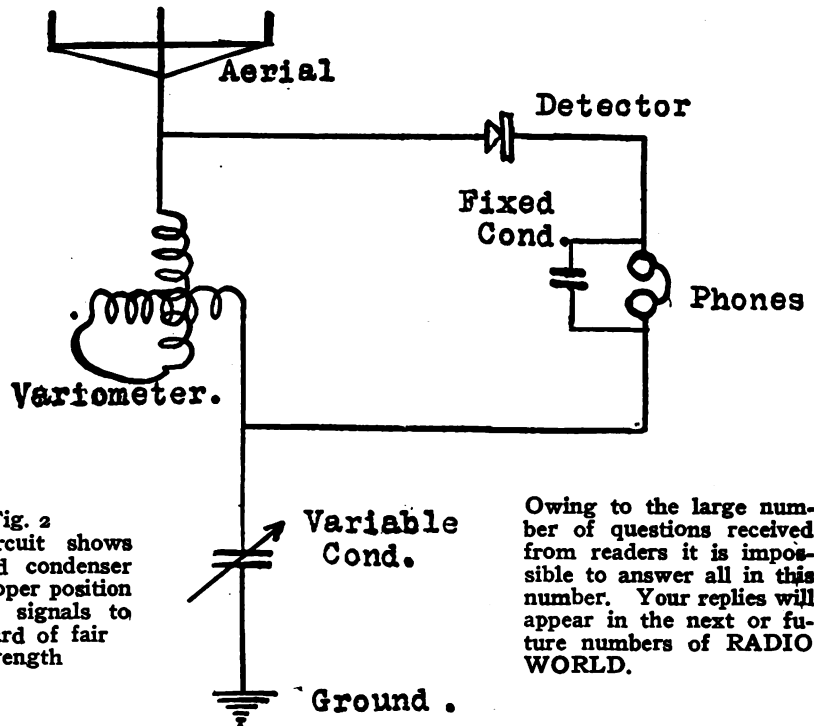


Fig. 2
This circuit shows the fixed condenser in its proper position enabling signals to be heard of fair strength

Owing to the large number of questions received from readers it is impossible to answer all in this number. Your replies will appear in the next or future numbers of RADIO WORLD.

Kindly tell me the necessary parts I must purchase to make the true-and-true receiver described on page 23 of RADIO WORLD for April 1.—Walter C. Mantle, Leonia, N. J.

Do not attempt to make this receiver if you are not an experienced radio amateur. However, for another good short-wave receiver we refer to page 15 of same issue which contains a description of the necessary equipment.

What make of a wireless phone would you recommend for a home.—R. G. Dove, Huntington, Pa.

We cannot advise particular receiver by name, but would suggest you purchase a regenerative set which includes a two-step amplifier. This equipment would cost, approximately \$130.

Why is a crystal called a rectifier and how does it act to make undamped radio currents audible?—E. J. S., Brooklyn.

Your question is very pertinent at the present time; as there have been several erroneous accounts given in the news columns lately of this element, the most important in the receiving set.

Do all regenerative circuits come under the Armstrong patent?—C. H. P., Brooklyn, N. Y.

The Armstrong patent is a basic patent and covers all circuits pertaining to regeneration, or, in other words, anyone who employs any type of a feed-back directly or indirectly

in the plate circuit, is infringing on his patents. Recent court decisions seem to uphold this patent as standard. All regenerative circuits are practically Armstrong circuits.

Radio and the Woman



(c. Underwood & Underwood.)

The Dolly Sisters—Rozika and Yanci—internationally famous as dancers, listening to a radiophone concert in their dressing room in a New York theatre. An aerial was installed on a water tank on the roof of the theatre and a lead-in to their dressing room did the rest.

A FRIEND was very recently reproving her young daughter for her disinclination to study grammar.

"Heaven knows what you'll do, child, when you're old enough to acquire languages," the mother sighed despairingly.

"Oh, I'm not worrying about that, mother," the small delinquent replied, optimistically, "because, by that time, books won't be necessary; it'll only be a case of calling up Madrid or Paris and swapping accents with someone by wireless!"

* * *

A true but curious story came to my ears the other day—the story of a very rich woman who, as a result of unfortunate investments in stocks, had lost nearly all her money. Threatened with physical breakdown, due to consequent worry, her physician ordered her to spend some months at her one remaining possession, a lodge in the Adirondacks.

Acting on his advice, she went there. In order to kill the tedium of long

days and evenings, she had a radio receiving-set installed. While listening on the news, market and stock reports, one day, some information was given her that fitted in exactly with something she needed to know, and so, by getting into quick touch with her brokers, the result was, that eventually, she was greatly benefited financially.

* * *

The gifted possessor of a splendid speaking-voice tells me that lucrative engagements at a certain broadcasting station has meant much to a mother for whom change of climate was absolutely necessary.

* * *

Someone tells me that the show-window of a millinery shop on Thirty-fourth street, displays a sign which reads: "Come in and see our radio designs."

* * *

A daily newspaper presents a picture of a pretty girl being kissed by wireless; and, in an adjoining column, I note an account of an in-

troductory which took place by the same means, between another girl and a young man and which eventually ended in romance. To any alarmist who reads this department, I am licensed to convey the assurance that though we women are as keen on radio as is the masculine sex, this mode of demonstrating affection, and of meeting, is not likely to become a fad with us.

* * *

Now, that Upper Fifth Avenue women are devoting a great deal of time to radiotelephony, I'm wondering when the other end of the street will be heard from. Perhaps it will be through the medium of future editions of fiction magazines that their voices will come through the silences.

* * *

Besides me lies a letter from a college girl who writes that with the proceeds of a small newspaper, she sold and printed in the suburb where she lives, she is enabled to finish her third term. She adds that practically all the press information she supplied was gleaned from listening in on her brother's aerial set.

* * *

A wire hairpin by a girl to complete a regenerator outfit offers amusing evidence that, in an emergency, we women are equally as capable and as practical as men.

* * *

Here's hoping that it will be a woman architect who will draw up the plans for New York City's first broadcasting station. That would, indeed, be a "feather in our cap!"

* * *

An anxious mother confides that the purchase of a receiving set for her son has done away with the difficulty of keeping him at home evenings.

* * *

It is to be sincerely hoped that, before long, churches will adopt radio devices which can be loaned out to invalid women or other "shut-ins" who would be spiritually benefited by the Reverend J. P. Stocking's—or any other divine's—sacred services. It seems almost a duty of the nation's clergymen to look into this.

* * *

We were discussing this great new field that has opened up, and someone asked:

"Do you recall how, not so many years ago, country folks had their telephones connected with the one in

the room where church service was going on?"

The question recalled those days; but, too, it brought the realization that those few who then listened in, were merely the advance guard of a great host that has arisen in these more enlightened times.

* * *

When last I saw my delicate-featured, gray-haired, little caller, she had seemed worried and depressed over the fact that though her only son had married and settled in the West, no invitation which would enable her to meet and love the young daughter-in-law, had been forthcoming. To-day, when she dropped in for tea, after several months, my feeling of surprise at her changed and cheerful appearance must have revealed itself; for, when I asked if she'd heard from her son, she said:

"Indeed I have; and not only that, but I've just returned from a visit with him and my daughter-in-law."

"And how—" I started to ask, when she stopped me with a gentle pressure on my arm.

"My dear," she said, recalling, no doubt, how deeply I had shared her confidence. "I should like to tell you all about it. You know how badly I felt when John failed to send for me. And how, for a long time, I wondered if—if it were because—well, you know how boys are, I really wondered if he was ashamed of me—if he dreaded having the brilliant, accomplished girl he'd married, meet his old-fashioned mother. The thought worried me. Then, Christmas came, and with it a present from John of one of those wireless outfits which, he said, 'would keep me company.' Yet, no invitation. However, I made the best of matters and the radio helped a lot. I listened in on it practically all the time, until one day, when a clever friend called and happened to ask how so secluded a person as myself managed to keep up so well on current events and things in general worth knowing, I awoke to certain possibilities that I had right at hand without having realized it before."

I interrupted with a trace of bewilderment.

"But what has all that to do with John and the invitation you were anticipating?"

Her eyes lighted whimsically.

"Everything! The information I obtained by wireless brushed all my mental cobwebs away; and when I realized how educational were the many topics transmitted, I studied hard and learned to absorb them almost unconsciously. I even enjoyed the fashion talks since they helped me remodel my wardrobe."

"Then—" I broke in, "one day, John sent for you."

She nodded.

"Yes, and I went there. I found his affection for me as strong as in the days before he married, yet there was anxiety in the kiss with which he welcomed me. Only when, as the days passed and he saw his wife and I sharing much in common, heard me able to discuss subjects she and their friends were interested in, did his vague look of fear of embarrassment fade from eyes that are so like his father's and a little gleam of pride come into them. He's a good boy, you know—and he was very anxious that his clever wife would share his love for me."

"We women must give strict heed to this new science—wireless," she said, "there's no limit to the help it's going to give our sex!"

At a dance recently given by a woman's club, the novelty of having the program supplied by radiotele-

phony attracted a much larger attendance than has appeared in previous years, and reduced the club's financial outlay that had gone to defray the expense of hired entertainers.

* * *

Many bachelor girls, intimidated—and with reason—by the present crime wave, tell me they are counting on radio to make the city's highways and byways so safe that American women may again walk abroad.

* * *

Will it be necessary for the telephone operator to look for a new job? In three exchanges in Greater New York, dials have been installed which must be punched by the person wishing to call a number. It is claimed that in ten years, the smiling utterance, "Operator!" may be heard no more; that the new-self-service will be a time saver; that it will make for accuracy.

—R. R. G.



(c. Underwood & Underwood.)

"Send Me a Kiss by Wire" is the title of a lilting ballad popular some twenty years ago when radio was only a vague dream. Today it may be actually accomplished. And here is Miss Gladys Wyville, at the amateur show at the Hotel Pennsylvania, in the act of transmitting an osculatory greeting to a faraway friend.

Radio Merchandising

A Department of Service for Dealers
Selling Campaigns and Problems

Send us Your Trade Notes

RADIO WORLD will be glad to receive trade notes of interest from radio manufacturers and dealers everywhere. If you are making a change in your address, are installing a new department, engaging a new manager or are doing anything of importance in the radio industry, send a line to our Trade Department and space will be accorded you.

If you have any suggestions to offer, let's have them. RADIO WORLD wants to work hand and hand with the trade.

Address letters for this department to the Trade Editor, RADIO WORLD, 1493 Broadway, New York City.

New Battery on Market

A new radio battery is being introduced by the Enco Electric Novelty Co., Inc., under the name of the "Super Enco." It consists of fifteen standard unit-cells compactly packed in a protected container. The manufacturers claim for this battery, two distinct features: the elimination of all wire connections by a patented system of spring connections and the ease with which any one of the cells, upon becoming defective, can be replaced by a new one, saving the cost of a new battery.

New Service for Receiving Sets

Failure to hear distinctly is due sometimes to a weak magnet in one or to both of the ear pieces of the head set. It is not generally known that these ear pieces can be remagnetized, thus saving the cost of a new set of phones. A service for remagnetizing weak radio-receivers at a nominal cost has been instituted by P. K. Richards of 204 West 76th Street, New York City.

Brooklyn's Big Show

Brooklyn claimed another radio victory when the Brooklyn Radio Exhibitors closed their doors to the public on Saturday night. Thousands of radio enthusiasts witnessed the great display that was given by the Brooklyn dealers. There were many features along the lines of efficient re-

ceivers, especially the phonographs, in which the receiving apparatus is hidden from view sending forth great volumes of music from the various broadcasting stations. The crowds were mostly interested in the music which was being displayed by the United States Navy. A special attraction was their latest type of receiver and transmitter.

In many respects it was the greatest display made.

Radio Makes Firm take Larger Store

The increasing interest in radio has forced The Howells Cine Equipment Co., to move to 740 Seventh Avenue, New York City, in order to have more room for the many articles of radio equipment rapidly coming into the market. The officers of the company are David P. Howells, President; Joe Hornstein, Vice-President and General Manager.

New Radio Corporations

Radio Manufacturing and Rental Corp., equipment, \$1,000,000; William J. Nicolosi, Mount Vernon, N. Y.; Isaac Perkman, Brooklyn; Josephine Berdais, Astoria, L. I. (David J. Reinhardt, Wilmington.)

Radiolite Corp., New York City, \$20,000; S. Goldstein, H. Harris, A. Bondheimer. (Attorneys, Kirk & Diamond, 130 Fulton Street.)

Wireless Supply Co., New York City, \$10,000; C. W. Preston, G. Bender, A. P. Wolheim. (Attorney, R. C. Birkhahn, 42 Broadway.)

Wavoolian Radio Corp., Wilmington, Del., signals, \$10,000,000. (Corporation Trust Company of America.)

Vernart Radio Equipment Corp., New York City, \$25,000; R. V. Colton, H. and A. Schwerin. (Attorney, E. F. Spitz, 141 Broadway.)

Simon Radio Corp., Wilmington, Del., manufacture apparatus, \$200,000. (Corporation Service Co.)

Radio Garment Co., New York City, \$10,000; M. P. and J. P. Cohencious, A. Wexler. (Attorney, D. Cohen, 165 B'way.)

J. C. Linder Electric Co., Buffalo, contracting, \$50,000; L. S. and W. A. and J. C. Linder, Jr. (Attorneys, Bartlett & Roberts, Buffalo.)

Wintner Radio Corp., Manhattan, \$25,000; L. and A. Wintner, A. Schein. (Attorneys, Drescher, Orenstein & Deff, 255 5th Ave.)

Keystone Electric Co., Philadelphia, \$50,000. (Corporation Guarantee and Trust Co.)

Radio Research and Service Corp., radio receiving sets, \$250,000, Wilmington, Del. (Delaware Charter Co.)

Radio Garage, New York City, \$20,000; I. Miller, A. S. Alter, J. Presser. (Attorneys, Kahn, 61 Park Row.)

Ildar Radio Mfg. Corp., New York City, \$10,000; B. Weilheimer, J. Rosner, R. Roschow. (Attorney, M. B. Gluck, 97 Warren St.)

United Piano Corp., New York City, \$1,000,000; P. T. Davis, L. E. Sisson, A. Ohlsen. (Attorney, W. A. Hall, 20 West 45th St.)

West Chassey Electric Co., Clinton County, \$25,000; J. F. and E. L. and J. L. O'Brien. (Attorney, C. M. Harrington, Plattsburg.)

Radio World Brings Advertisers Results

Telephone Barclay 5553

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Radio Machines and Radio Supplies

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Gentlemen:

We take pleasure in notifying you that we have received numerous replies to our advertisement placed in the first issue of your magazine.

We have noted the clear and clean-cut articles which we have read with interest. It seems sure that this medium will be a "Business Getter."

Yours very truly,

ROBIN RADIO MFG CO.

per Elias G. Robin.

CGR:JL

April 5th, 1922.

Soon There Will Be Plenty of Tubes

AN interesting and rather specific statement bearing on the present-day shortage of radio broadcast receiving-apparatus with special regard to vacuum tubes—the very “heart of radio”—is announced by the Radio Corporation of America. We are told that the April production of vacuum tubes, used in radio transmitting and receiving sets, will reach 150,000. The production schedule for May calls for a total delivery of 175,000 vacuum tubes. The program will reach 200,000 a month or more in June, according to public and trade requirements.

Crystal detectors served the purposes of the larger number of amateurs in the early days. The great demand for vacuum tubes is a development of the past six weeks, due entirely to the sudden popularity of broadcasting. Although machines play a part in the major processes of manufacture, tubes are still largely made by hand. Hand work plays a far more important part in making vacuum tubes than in any other piece of electrical apparatus with which the public

is familiar. Manufacture of the delicate vacuum tubes used as detectors, transmitters and amplifiers, has been subject to the usual difficulties in bringing about quantity production.

During the first eleven months of 1921, the factories produced for the Radio Corporation of America an average of 5,000 tubes per month. This rate of production, small as it seems now, was gradually producing a surplus. Then, suddenly, in one or two territories, broadcasting jumped into popular favor over night. On December 30, the production schedule was increased to 40,000 tubes per month. In January of this year, the Radio Corporation of America pushed the schedule to 60,000 per month—a figure largely in excess of the demand at that time.

The present concerted demand, due to the further expansion of broadcasting, came early in February. On February 3, the factories were asked to do everything in their power to reach 75,000 vacuum tubes—to try to reach it during that month. They

did their utmost. They came close to the production goal, and the following month, March, they not only reached 75,000, but bettered it by several thousand. April calls for 150,000 and May for 175,000.

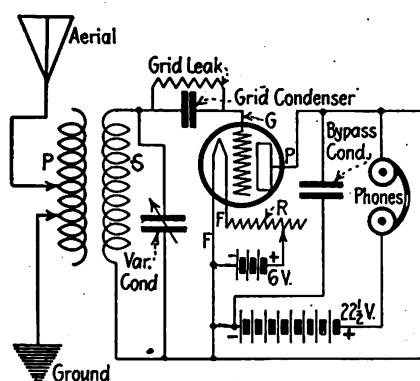
In the event of this surplus from the present expanded program, facilities will be further increased. It is easier to increase production now than in stock, whereas only one would be easier to increase the size of a large and well-trained organization than to build a new one. Technically trained forces are required in the factories, which are working with skill and energy.

The production program of the Radio Corporation of America is set higher than the existing demand during the month the orders are placed at the factories. It is frankly recognized, however, that one prospective purchaser may inquire at five stores, thus creating the impression that five sales would be made if the tubes were in stock, whereas only one would be made.

Tube Receiver Worth Trying

This detection circuit has a condenser in series with the grid.

Usually with this connection and no oscillations in the grid circuit, the grid and filament are at zero potential and no current flows in the grid



An inductively coupled receiver employing a single three element electrode tube.

circuit; that is, no electrons pass from the filament to grid. By use of a grid condenser and a variable grid leak, the grid can be held at any desired negative potential.

Keep Your File of Radio World Complete
If you did not get the first two issues of RADIO WORLD, you can get them through the American News Co. and its branches, or send 15 cents per copy to RADIO WORLD CO., 1493 Broadway, New York, N. Y. (Adv.)

Newark's First Radio Show

Newark, New Jersey, now one of the largest broadcasting centers in the country, will hold its first radio exhibition next week, beginning Wednesday, at the Robert Treat Hotel. This promises to be a show of unusual interest. It has attracted many prominent exhibitors. Next week's RADIO WORLD will review its many features.

Complete your files by getting Nos. 1 and 2 of RADIO WORLD and save them so that you can have 52 copies bound at the end of the year. If your newsdealer cannot supply you with the copies, he can get back numbers through the American News Co. and its branches, or copies at 15 cents each, will be sent direct from publication office, or better still, subscribe and have your subscription start. RADIO WORLD CO., 1493 Broadway, New York, N. Y. (Adv.)

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His Radio Pathfinder Guides Deep-Sea Vessels Safely into Port

SHIP OWNERS, radio operators, government departments, and others, are giving much attention to the importance of providing on shipboard radio direction-finding equipment by means of which the position of a ship can be quickly and accurately determined. This matter is receiving attention in various foreign countries as well as in the United States. The provision of radio direction-finding equipment on a ship may eliminate serious delays caused by a ship being unable to enter port during a fog because its position, or the bearing of lighthouses is not known. In case of wreck, such equipment may be the means of saving many lives.

The radio-direction finder is a device for determining, in a simple manner, the direction of a radio transmitting station with reference to the point at which the direction finder is

located. The direction finder has a considerable number of very practical applications, of which one of the most important is its use as an aid to navigation.

Sound and visual signaling-devices have been employed for many years as aids to navigation. Lighthouses and lightships with their characteristic light-flashes and sound-signals are established and maintained along the coasts and at harbor entrances, in order that shipping may be carried on with maximum safety. During fog or thick weather, however, the sound and visual signaling devices frequently do not give reliable service.

The radio direction-finder is not affected by fog, and has the further advantage that it will operate over much greater distances than sound and visual signaling devices.

The Department of Commerce has

developed a system of radio direction-finding which has proved to be very simple, practical, and dependable. This system has been developed by the Bureau of Standards in co-operation with the Bureau of Lighthouses. The first installations were made in the Third Lighthouse District with headquarters at Tompkinsville, New York. A common type of direction finder which has been used for installation on shipboard, consists of a coil of ten turns of insulated copper wire wound on a wooden frame, four feet square, which is mounted so that it may be rotated about a vertical axis. Suitable radio receiving-apparatus is used in connection with the coil, and in recent installations has consisted of a variable air-condenser for tuning purposes, a balancing condenser for increasing the accuracy of observed bearings, a six-tube amplifier having three stages of radio frequency amplification, a detector, and two stages of audio-frequency amplification, batteries, and suitable telephone receivers.

As the coil is revolved about its vertical axis, the intensity of the signal which is being received from the station whose location is to be determined, diminishes until a minimum is reached, which occurs when the plane of the coil comes to a position at right angles to the line of direction to the radio-transmitting station. At this point of minimum signal, the radio bearing is read on a suitable scale, which may be either a fixed scale, or the card of a magnetic compass.

In developing this system of direction-finding, the Bureau of Standards has made a study of the distortion effects which may result from the presence of adjacent objects, such as the mass of a ship, and methods of eliminating errors which such distortion may cause in observed radio bearings. A particularly careful study has been made of distortion effects on shipboard and methods for correcting these effects by calibration.

Practical methods have been developed for simplifying the operation of the direction finder. The direction finder is essentially a nautical instrument and should be installed on shipboard where it may be used directly by the navigator in taking bearings on radio signaling stations established on shore or on light vessels. This can

Radio Set Fits Snugly Into a Watch



(c. Keystone View Co.)

The marvelous interest that the younger generation is taking in radio is a tremendous asset for its lasting qualities. It is, perhaps, the greatest element for keeping the young folks interested in the home that the world has ever known. Here we have the likeness of Henry Levison, fifteen years old, of Norwood, Ohio, who has made a radio set so small that it will fit in a watch-case. With this remarkable device, he is able to hear concerts broadcasted from Pittsburg.

Is Your Club on Radio World's List?

RADIO CLUBS are organizing everywhere, and promise to become a powerful source for education and entertainment throughout the country. If your club is not on this list, let RADIO WORLD hear from you. Send in your name and address and the name of the officer to whom membership applications should be made.

Society of Amateur Scientists, 225 Lynch Street, Brooklyn; H. M. Cleon, secretary.

Rho Delta Omega Fraternity, 1020 East 13th Street, Brooklyn, N. Y.

Hudson Radio Club, 301 West 88th St., Herbert Weil, Jr., secretary.

Chelsea Radio Association, 317 West 19th Street; Martin J. Prendergast, secretary.

The Junior Radio Club of Bensonhurst, L. I., 18th Avenue; Frederick Horbelt, secretary.

Baldwin High School Radio Club, Baldwin, L. I.; Theodore Bedell, secretary.

Hudson City Radio Club, 37 Sherman Avenue, Jersey City; V. Gilcher, secretary.

Radio Association of Greater New York, 701 West 179th Street; Arthur K. Ransom, secretary.

Jersey City Radio Club, 47 Duncan Pl.; Karl Franck, secretary.

Radio Club of America, 380 Riverside Drive; Renville H. McCann, corresponding secretary.

Nutley Radio Club, 293 Whitford Avenue, N. J.; C. K. Rogers, secretary.

West Hoboken Radio Club, 608 Hague

Street, West Hoboken; Peter Aymar, secretary.

Franklin Radio Club, 1307 Franklin Avenue, Bronx.

The Roosevelt Memorial Radio Club, Public School 19, Joseph C. Musumeci, secretary.

City Y Radio Club, 87 West 33rd Street, Bayonne, N. J.; Arthur Kohn, secretary.

Y-R-Les Radio Club of Brooklyn, 1246 Gates Avenue, Brooklyn; Harry Ewing, radio bug promoter.

Corona Radio Research Club of Corona, L. I., 63 Hayes Avenue, Corona; Daniel Moran, secretary.

New Utrecht High School Radio Club; Monroe Selig, secretary. Thesis on radio required before admission.

Radio Club of Long Island, Plaza Business School, Queensboro Bridge Plaza, Long Island; Donald W. Exner, publicity manager.

Columbia Preparatory School Radio Club, 301 West 88th Street.

Columbia Preparatory School Junior Radio Club, 301 West 88th Street.

Columbia Preparatory First Girls' Sorority, 301 West 88th Street.

Metropolitan District Radio Club, E. F. O'Hanlon, financial secretary.

White Plains High School Radio Club, White Plains, N. Y. Frederick J. Lee, 1 Intervale Street.

Boys' High School Radio Club, Brooklyn; Daniel J. Wexler, secretary.

Greenpoint Radio Association, 79 Eagle Street, (Brooklyn, N. Y. H. W. Gerlach, secretary, 113 Oak Street, Brooklyn.

Ridgefield Park Radio Club, Marden R. Nystrom, secretary, 333 Main Street, Ridgefield, N. J.

Radio Club, High School of Commerce, 155 West Sixty-fifth Street; Fred Sage, secretary.

Westfield Radio Club, Pearsall Building, Westfield, N. J.

Independent Radio Club of New Jersey, Newark, N. J.

Independent Radio Club of Elizabeth, N. J.

Somerville Radio Association, Second Reformed Church, Somerville, N. J.; S. Barton, secretary.

Harlem Radio Club, 340 East 105th Street; Almo Bertoles, 233 East 112th Street; secretary.

Hawk Radio Club; Nathan T. Kwit, secretary, 673 Hendrix Street, Brooklyn, New York.

Junior High School 55, the Bronx, Radio Club; Solomon Galub, secretary, 522 St. Paul's Place, the Bronx, N. Y.

AAlance Radio Club, 60 Amboy Street, Brooklyn; J. Fabricant, director. For juniors only.

Radio Club of the South Brooklyn Y. M. H. A., 345 Ninth Street, Brooklyn, N. Y., S. Levy, secretary.

Hackettstown Radio Club, Hackettstown, N. J.; L. J. LaRue, secretary.

(Continued from preceding page)

be done with the simplified form. Bearings may thus be taken rapidly, at any time, and as often as desired.

This system developed by the Department of Commerce should be carefully distinguished from another system of determining positions by radio, now in use, in which the ship transmits signals to radio-compass stations on shore, which radio's its position to the ship. This system avoids the delays and errors likely to occur in depending on radio compass stations on shore, since with the latter, even under the most favorable conditions, valuable time may be consumed in making a request for bearings, taking bearings, and getting the information back to the navigator on the ship.

The radio direction finder, as used by the Department of Commerce involves a number of unique features. It is designed to be installed over the ship's binnacle carrying the magnetic compass card, so that the radio bearings are read directly on the magnetic-compass card. An additional scale is attached to the top of the binnacle and marked with the corrections obtained by calibrating the radio direction-finder. By these means the radio bearings are obtained in a simple and direct manner. The electrical features have been made such that the only operations necessary

when taking a radio bearing, are one adjustment in the radio receiving-set, and the rotating of the direction-finder coil.

A radio-transmitting station intended primarily for direction-finding work, is often called a "radio beacon." Radio beacons may be installed at small expense on lighthouses and lightvessels. The transmitting equipment may be designed to operate automatically by simply throwing a switch, so that no additional personnel is necessary. The radio transmitting equipment is set into operation by the lightkeeper, just as the other signaling devices at the light station. The expense of operation of the radio beacon is, therefore, small.

The Department of Commerce has established three radio beacons at the approaches to New York harbor, on Ambrose Lightvessel, Fire Island Lightvessel, and at Sea Girt Lightvessel, Sea Girt. These three beacons are now in regular commission and transmit waves of a frequency of 300 kilocycles per second. A wave length equals 1,000 meters. A radio beacon is being installed on San Francisco Lightvessel, No. 70. These beacons have automatic transmitting equipment so that no operator is necessary.

The Bureau of Standards has issued a publication describing this. This publication shows numerous

system of radio-direction-finding. photographs of a radio-direction finder of the type mentioned above, as installed on the pilot house of a light-house tender. Actual courses are shown which were run by means of radio bearings taken by the ship's navigator, on the three beacons at the approaches to New York harbor. In these tests, positions were determined by cross bearings on the three radio beacons, and courses were set for one of the light vessel beacons by taking a radio bearing directly on the beacons. The paper deals briefly with the principles of the operation of the direction finder, but is primarily concerned with practical development which has made possible a device sufficiently simple and accurate for use as an aid to navigation, and with practical applications which have been made.

Free Concerts Draw Crowd

E. Giges, proprietor of the Fordham Radio Shop, 140 East Fordham Road, New York, entertains a large crowd of radio prospects every Saturday afternoon and evening by extending a loud speaker to the front of his building and giving them the news and concerts as they are received in his store. Mr. Giges finds these free out-door concerts good trade pullers.

RADIO WORLD

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Chicago Claims First Radio Police

Chicago was the first city to officially adopt the radiotelephone for use in its police department, and, by means of this newest development of the wireless age, is better able to cope with crime.

The Chicago police, under the direction of Chief Fitzmorris, has installed a system whereby officers on patrol duty are in constant touch with head-



(c. International.)

A Chicago patrolman showing the small receiving apparatus which is carried on the arm. The buzzing of this miniature receiver informs the officer that headquarters is sending out orders.

quarters. Each patrolman is furnished a pocket wireless-set by means of which he is able to pick up messages from headquarters. If the report of a crime is received at headquarters, the alarm is sent out immediately and all officers are quickly informed.

A flying squadron of automobile radio-stations is also included. These autos are fitted out with a full transmitting set and are able to send messages in addition to receiving the new service is practical.

Radio Skeptics take Notice

By John Peere

The limits of the radiophone are boundless. There are still some people who persist in calling this greatest of all inventions in physical science a novelty that will die just as quickly as other "fads" died.

There will always be people whose limited visions in such things as these, extend only to the end of their noses. They are the people who are sorry that they didn't think more favorably of the invention of Alexander Graham Bell, and buy all that loose stock that was for sale at that time.

It is not so very far back when the Wright Brothers were ridiculed all over the country; when they were called fools that did not know enough to stay on the ground; and when Thomas A. Edison won about the fifteenth prize at the Exhibition in Paris for his phonograph. The French people thinking that it would never prove to be anything more practical than a toy fit only for children.

It is very possible that it is a good thing that this world is made up of many people who are skeptic of all new inventions, because otherwise; wise folks would never be able to get in at the ground floor, so to speak. However, the question is often asked,

"Just how useful will the radiotelephone be, in our private and national affairs." The radiotelephone is still in its infancy.

Reports from Republican and Democratic headquarters indicate that the next campaign will be largely carried on by the radiotelephone. Office seekers and political hangers-on will talk to their constituents without making the dramatic gestures that has always been so effective with election audiences.

The young husband who thought he had solved a way to enter his house after an all-night visit to his sick friend had better beware: His rubber key won't do—if certain progressive wives have their way. We were told already of a young wife who has purchased a four-step amplifier to be used in certain emergencies.

The youthful Romeo, instead of hanging around the street corner "sparking all the Janes," will say something like this, "Dearie, what's your wave length."

Baseball fans will cause small outfits to be installed in their offices so that every time that "Babe" Ruth hits one on the nose they can chalk up another run for the Yankees.

Radio Nets for Airways

For the collection, dissemination and exchange of meteorological data by and between stations of the Army and Navy Air Services along the New York-Washington, Dayton-Washington and Norfolk-Washington air routes, the Army Air Service is engaged in the construction and installation at Mitchel Field, Mineola, L. I.; Langley Field, Hampton, Va.; Langin Field, Moundville, W. Va., and Wilbur Wright Field, Fairfield, Ohio, of permanent radio stations, says the New York "Times." Those at Moundville and Fairfield are to be spark sets of 5 kilowatt capacity and those at Mitchel Field and Langley Field to be continuous wave tube sets of approximately 3 kilowatt capacity.

It is expected that when completed these stations will have an ordinary reliable daylight range of approximately 300 miles and will provide for the immediate transmission to all fields and stations on these routes of weather reports, storm warnings and all conditions affecting flying. Such an arrangement will make available to a pilot about to start on a cross-country flight from any one of these points the flying conditions actually existing at his point of destination and along his intended route at the moment of his departure. In speaking of the new station, Captain Oliver S. Ferson says:

"It is hoped that the inauguration of this system of inter-communication between Air Service fields and stations will obviate the possibility of a recurrence of accidents similar to that which occurred at Morgantown, Va., when a number of lives were lost as a direct result of an airplane flying into a storm of which it had no previous knowledge.

"The Air Service contemplates the extension of this radio net to eventually include every Air Service field and station in the United States, and a large number of competent radio operators will be needed to man the stations now being erected and to be installed in the future. Since the sets to be used are the latest type, the training obtained in the care and operation of these sets cannot be surpassed by training elsewhere, and

taken in conjunction with the installation and maintenance of radio sets upon airplanes, will enable a radio operator in the Army Air Service to keep in touch with the very latest radio developments and practices.

"Radio operators enlisting in the Air Service now may later, upon their own application, when found qualified, be sent to the Air Service Communications School at Post Field Fort Sill, Okla., for the concentrated course covering radio construction, operation and maintenance. A certificate of graduation from this school is evidence that the holder is qualified for promotion to the grade of non-commissioned officer."

Musicians Object to Radio

The American Federation of Labor is watching radio closely. It has been brought to the attention of that organization, by the Musicians' Union which purports to see a menace in the increasing favor of radiophone music as the accompaniment of moving-picture shows. The musicians claim that thousands of their craft throughout the United States may be affected by the possibilities of the mechanical orchestra.

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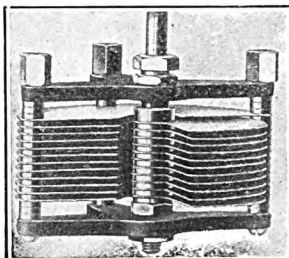
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Why Radio Has Come to Stay

The Government's interest in the wireless telephone began during the World War, when there was a shortage of radio operators. It encouraged amateurs in every way, and recruited its war force from their ranks. Now, however, instead of having to urge amateurs to take up his new business the Government is flooded with applications from people in all parts of the country who want licenses for sending stations.

It was out of this condition that the Radio conference developed. The craze has become so widespread that it is highly necessary that something be done to coordinate all wireless processes, so that radio operators will not drown each other out.

Radiotelephony has come to stay and in no sense will it handicap or interfere with other established methods of communication, says "The Times" (Los Angeles, California.)

The commercial telephone is not to be put out of commission and the land service of the telegraph will continue in full importance and operation.

On the other hand, the radiotelephone is not to be considered in the light of a fad or a toy, for it opens a definite field of education research, the value of which has already been acknowledged by the Government and by the public.

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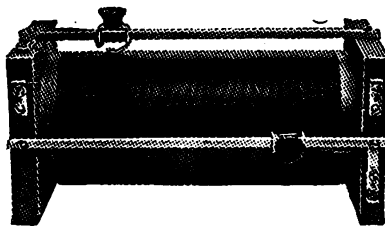
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What Causes "Squeal"

The "squeal," or "howl," frequently heard by amateurs who experience difficulty in receiving the broadcasting stations, is caused by hetrodyning. This is the condition created by the waves of two or more stations colliding.

Hetrodyne, according to a writer in the New York "Globe," is best explained by comparing it to the "beat" set up by two electric motors or gasoline engines. If two engines are running side by side, such as an airplane or speed boat installation, the observer will hear a sort of droning noise. This humming will seem to speed up and then slow down, and at certain stages it will seem to hang stationary for a few seconds. This always happens when the two engines are running within a few revolutions of each other. If they are both running at exactly the same speed the drone will not be apparent, but this condition is almost impossible to attain so there is always the peculiar hum present.

This peculiar drone is caused by the difference in the speed of the engine and may be directly likened to the theory of hetrodyning. The engines both have a different period of vibration or frequency and owing to the speed at which they are running this period changes slightly all the time. It is the difference that makes the drone.

Exactly the same thing happens in radio. Two stations that are operating on the same wave length will send out waves of a slightly different frequency, and it is the difference in the frequency that makes the "squeal" at the receiving set. Owing to the extremely high frequency of the wave emitted by a radiophone station, it is inaudible to the human ear, but when two of them are operating at the same time the difference in frequency makes the squeal that is distinctly audible.

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To Catch Broadcasting on Electric-Light Circuit

EVER since the recent announcement by Major General Squier, Chief Signal Officer of the Army, that radio broadcasting could be diverted to the wires of an ordinary electric light current, the General's headquarters have been flooded with inquiries from ambitious amateurs as well as from manufacturers of radio apparatus.

It was learned, however, says a Washington Dispatch to the New York "Times," that while the system has been amply demonstrated by the Signal Corps, requires technical skill perhaps beyond that of the amateur. There are certain principles invoiced which demand acquaintance with electrical science, and the discovery is not ready for experimentation by the uninitiated.

All over the country, amateurs seem to have been attempting to emulate the Squier achievement, with the result that hundreds of electric circuits have been burned out. Experts of the Signal Corps say there are two ways to avoid this. The first is to connect up only one wire from the aerial connection on the receiving apparatus to a terminal of the plug to be screwed into the wall socket. The second, which is more desirable, is to lead two wires from the wall plug and to "shunt" in across these a "fixed condenser," and then to lead one wire, preferably the "grounded" wire, to the aerial connection.

Up to date, the experiments conducted by the Signal Corps have been carried on only over a direct current. What the result would be on an alternating current is not known.

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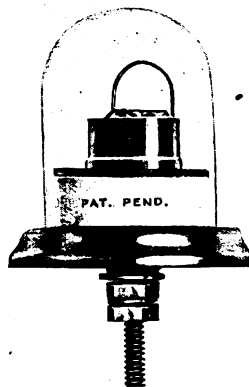
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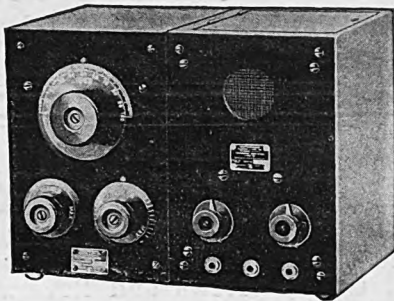
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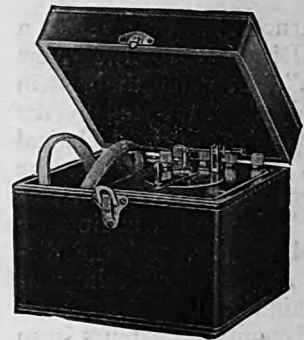
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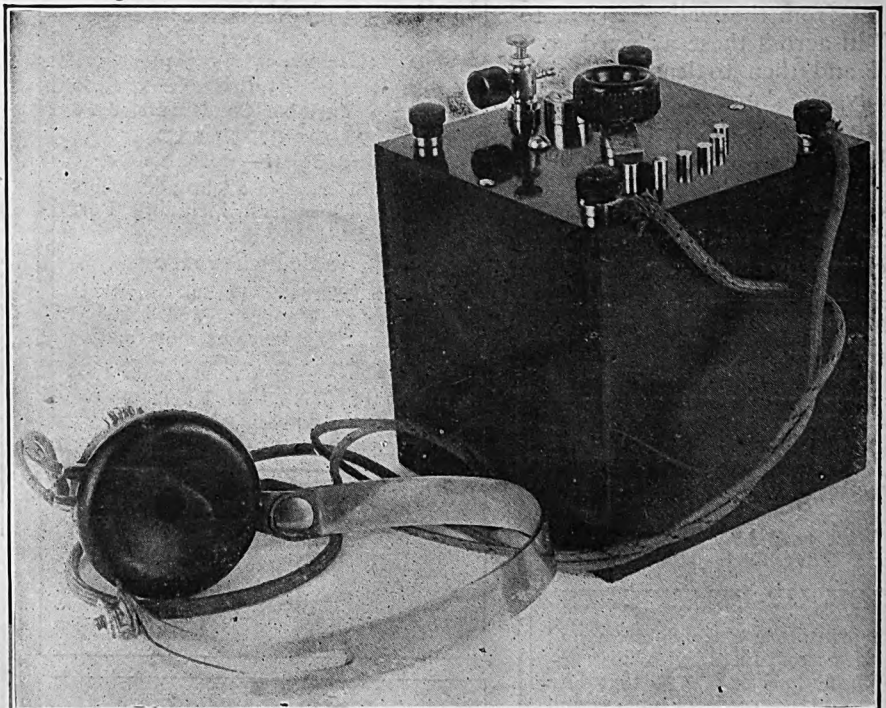
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Wants More About Telegraphy

I have just bought the second copy of RADIO WORLD I am so pleased with it that I am going to take a subscription.

There is only one fault I find with it. You have too much of this phone "stuff." A little more telegraphy and less telephony will about make your magazine 100 per cent. perfect.

I read with joy the charges brought by Attorney-General Daugherty. If somebody would wipe out entirely these broadcasting stations it would be a boon to wireless.

I have been interested in the game for eight years, and have had a set working for three.

Anybody can get these broadcasting stations, but let some of these people sit down. If they can copy, code, and try to copy an "8" or "9", some night, with his "Wonderful Westinghouse" set.

I notice on page 11 of RADIO WORLD, under the title of "The Broadcaster," you tell about the growth of radio. I don't call that growing. It might be in quantity, but not in quality. How many of these new "hams" can tell you anything about wireless. About one out of twenty.

The broadcasting stations are trying to shut the amateur up until after eleven o'clock. I can get hundreds of amateurs to back up my statement.

Another thing you said is, "Since its creation, the radio telephone has grown from the baby of the amateur to a giant entering thousands of homes." How do you get that way! "Baby of the amateur!" Why if it wasn't for the amateur where would the navy get its operators. If it wasn't for the amateur where would you get the man to run these big stations. If it wasn't for the amateur, there wouldn't be any wireless.

RALPH R. GARRICK,
Operator JART, 3 P. M.

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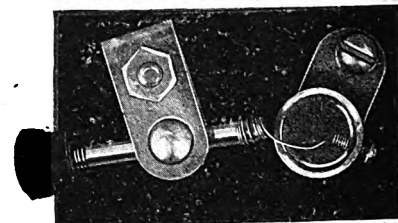
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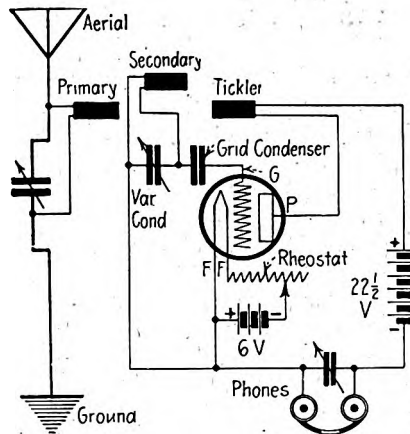
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Solving the Puzzle of the Honeycomb

By Fred. Chas. Ehlert

THE writer wishes to bring forward the question of using honeycomb coils, which seems to puzzle many amateurs. These so-called inductances are to be used exactly like any other type inductances having a fixed value. They differ from the inductances usually employed for radio telegraphy in this way: Instead of having the inefficient taps connected to cumbersome switches, each coil is provided with a plug which fits into a receptacle in the coil mounting, taking the place of a mechanical coupler. Condensers are connected in series, or parallel with the coils, which provides the tuning qualities of the coils to a given wavelength; and if it is desired to receive stations with wave lengths beyond the range of the condensers, larger coils must be substituted. In this way, the losses due to dead-end turns and high-resistance taps are done away with.

The ultra-honeycomb coil with the duo-lateral winding is an improvement on the honeycomb coil, and is well worth any additional cost. The De Forest ultra-honeycomb coil differs from the honeycomb coil in this respect; it has incorporated a duo-lateral winding and, therefore, has all the electrical advantages that characterize this new type of winding.



Circuit displaying the units of honeycomb coils. With the proper mounting and connections an ideal regenerative-set can be made. Suggested by Fred Chas. Ehlert. Drawn by F. Newman.

The duo-lateral winding differs essentially from the older honeycomb type. The wires are not laid directly above one another, but are so arranged that parallel wires in consecutive layers fall in between one another instead of being directly above or below one another.

The obvious advantage of a lower distributed capacity and lower dielectric loss, which results from such an arrangement, makes the coil unexcelled for radio work where extremely

low distributed capacity and extremely low dielectric losses are essential.

The proper coils for use as secondaries of a loose coupler shunted by the usual .001 variable air-condenser may be readily chosen from the table given below. There are coils for various wave length; so be sure, to purchase the right coils for the wave lengths desired. With an average aerial of .0007 MFD capacity, a primary condenser of .0015 MFD capacity coils will respond to wave lengths as follows. The figures in the table at the right indicate meters.

Number	Approximate Wave lengths with .001 MFD in shunt
DL-25	180—375
DL-35	180—515
DL-50	240—730
DL-75	330—1,030
DL-100	450—1,460
DL-150	660—2,200
DL-200	930—2,840

There are still coils which are made to respond to higher wave lengths.

If the desired coils are purchased and placed upon the inductance-coil mounting and connected, according to the accompanying diagram, good results will be obtained when using the tickler coil. By close coupling regeneration or undamped reception is secured.

Will Radio Hurt Vaudeville Shows

Just how far, if at all, is the radio-phone fad destined to cut into the patronage of musical shows—and vaudeville performances in which singing and talking acts predominate?

The answer is: Not so far that you could notice it, writes Ashby Deering in the New York "Telegraph." There are several reasons for this calm assertion based upon facts.

It is true that the Vaudeville Managers' Association of Newark, N. J., recently passed a resolution that they would not book artists who gratuitously or for pay gave their voices or the patter of their feet to the broadcasting station. Also the subject has been discussed by officers of the Actors' Equity Association, and there is some probability that the Equity Council will soon make a ruling to the effect all services of this nature must receive compensation.

Keeping Amateurs within the Law



(c. International.)

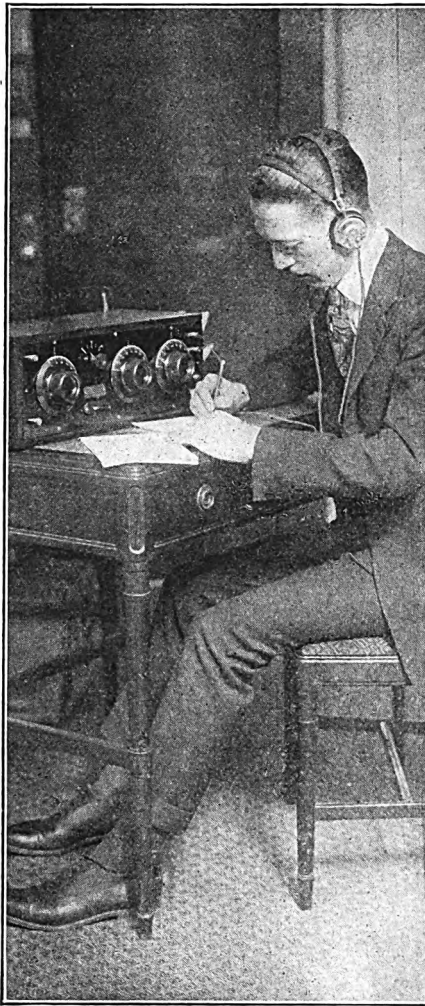
Many amateurs who have licensed transmitting-sets get very angry when Q. R. M. is bad and in turn try to succeed in advancing up a few meters in order to carry on communication with the distant operator. This is a direct violation of the rules and regulations of the radio law. In order to catch these violators, Inspector Schmitt, of Chicago—pictured here with his receiving set and wave meter—checks up anyone he finds working over the wave lengths allowed by law.

Radio as It Figures in Daily Events



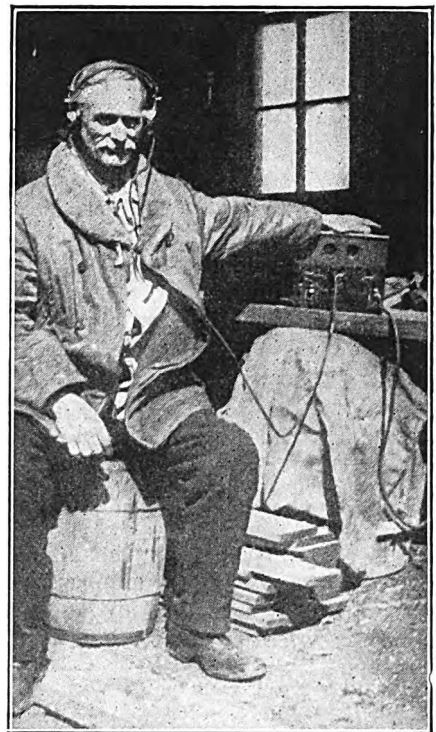
(c. Underwood & Underwood.)

Among the thousands of radio enthusiasts throughout the country a large percentage are school boys. This art has gripped the youngsters so strongly that they are laying aside their "Wild West" novels for "How to Make Your Own Radio Set." The picture shows a school boy listening to the results obtained from the variations of the tuning qualities which are being made by the instructor. There is no question that, within a short period, fifty per cent. of the nation's youth will be listening in on the concerts. With all this in mind, it is safe to say that the development in this art will soon be taking strides, as everyone knows that it was the boy amateur who brought the radio telephone, with its vast developments, to such a marked degree of efficiency that the entire world seems to be taking active interest in this remarkable achievement.



(c. Sport Commercial, N. Y.)

Frank H. Schnell, traffic manager of the American Radio and Relay League. This organization has 15,000 members and its object is to relay messages for mutual benefit. It promises to be a most useful organization.



(c. International.)

Now that market and weather reports are broadcasted, the farmer—the man most interested in the marketing of America's foodstuffs—finds that science has, at last, rendered him a great service. Here is an example. Charles Daugherty, a farmer, of Champagne, Ill., at 10 o'clock every morning, receives his crop news the radio way. The apparatus is rigged up in his barn. He is in touch, at the moment, with the latest reports from Washington. The farmers are among the most interested radio enthusiasts, and many have constructed their own radio sets, owing to the fact that the radio salesman has not yet penetrated the rural districts.



(c. International.)

Today it is possible for customers of the Noel State Bank, Chicago, to receive market and weather reports at the bank by radio. In the above picture, Miss Lydia Martin, radio operator, is receiving messages. The radio is set up temporarily in a room; but, if the innovation is successful, the bank will open a special "Radio Room."

Ernst F. W. Alexanderson

Life Story of the Chief Engineer of the Radio Corporation of America

By George H. Flint

ERNST F. W. ALEXANDERSON, chief engineer of the Radio Corporation of America, is the pioneer and leading exponent of the modern tendency to bring radio engineering on to the same plane with power engineering. His invention of the Alexanderson alternator was the first step in this line, this machine being in design and operation essentially a power unit.

Among the other inventions of Mr. Alexanderson in the field of radio engineering the best known are the multiple tuned antenna, by means of which the energy-wasting components of the total resistance of an antenna are greatly reduced and the efficiency of the radiating system correspondingly increased, and the magnetic modulator, which controls large quantities of power by the change in flux caused by a relatively small change in magnetizing current.

Mr. Alexanderson was born at Upsala, Sweden, on Jan. 25, 1878, the son of a university professor, A. M. Alexanderson, and Mrs. Amelie von Heidenstam Alexanderson. He was graduated from the high school of Lund in 1896, and afterward studied a year at the University of Lund. He

then entered the Royal Institute of Technology, Stockholm. This was followed by post-graduate work at the Koenigliche Technische Hochschule, Berlin.

Realizing that the larger opportunities for young electrical engineers were to be found in the United States, Mr. Alexanderson came to this country in 1901. His first position was as electrical draftsman with the C. & C. Electric Company of New Jersey, in 1902, he accepted employment with the General Electric Company in Schenectady. His advancement was speedy and he soon became a consulting engineer of the company. In November, 1919, he was appointed chief engineer for the Radio Corporation of America, a new company combining the radio interests of the General Electric Company and the Marconi Wireless Telegraph Company of America.

Mr. Alexanderson's radio researches have greatly extended efficiency of radio transmitting apparatus; he has also carried out no small amount of development and research in connection with radio receiving apparatus. Thus, during the recent European war, he evolved a

system of radio reception which has become the foundation of the modern directive method of radio reception. The immediate object of this receiving system, first known as the barrage receiver, was to eliminate malicious radio interference of the enemy, who might send out waves of the same or nearly the same wave length as those which it was desired to receive."

Through an ingenious combination of receiving aerial systems and special apparatus, he was not only enabled to eliminate such interference, but also to receive signals from European stations nearby to a high-power transmitting station in the United States, which operated on the same wave length as that of the signal being received.

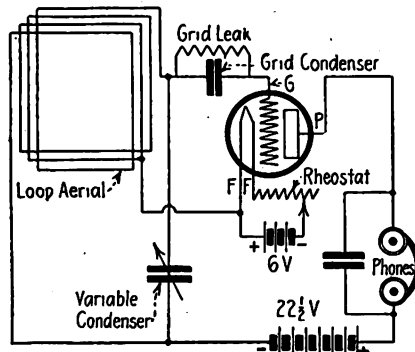
Other researches of vital importance were conducted by Alexanderson in the field of radio telephony. One of his developments consisted in the evolution of a complete duplex radio telephone system by which a subscriber to a land line telephone could establish connection with a radio telephone station and conduct a two-way conversation with the facility of an ordinary land-line circuit.

Hook-up for Loop Aerial Using V. T. Detector

THE loop aerial saves the expense of the outdoor aerial, but the radio amateur must bear in mind that the loop aerial is for receiving only and not for transmission. The loop has not sufficient insulation for transmission, and precautions should be taken not to use this type aerial for any transmitting purposes whatsoever. This loop takes but very little space and is inexpensive to make up. It is within the purchasing price of any amateurs pocketbook.

For direction finding and eliminating interference nothing is much handier than employing a loop aerial. The circuit in the accompanying diagram shows the loop aerial in which is employed a simple vacuum tube, but the writer admits that for efficient strength of signals a two- or three-stage amplifier should be connected on to the detector circuit. In discarding the open aerial for the loop, we must sacrifice this long aerial by plac-

ing the loop in a small area; therefore, to gain what has been lost we must apply this to our amplifiers. Some radio fans employ several stages of radio frequency, then detect the signal, then add a few stages of audio frequency, thence to the phone circuit.



Connections necessary for radio telephone reception employing loop aerial. Diagram suggested by Fred. Chas. Ehlert. Drawn by S. Newman.

Those contemplating a loop aerial, must bear in mind that if they use a loop they must employ a V. T., and, at least, a two-stage amplifier if good results are expected.

Radio Light the Latest

A wireless electric light which takes its current from the air, as sound waves are picked up by radio, is the invention of Juan J. Tomadelli, of Jersey City, N. J. His wireless light, apparently, approximates the cold light for years sought by scientists. The lamp burns with a white brilliance in any position. As it cannot be turned out, a metal curtain is provided for it.

According to the inventor, a 100-candle power lamp which he is manufacturing to sell at \$3 will burn three years without attention.

The process is secret, but the inventor intimates that the light is produced by the attraction of chemicals.

The Original Radio "Bugs"

Who They Are and What They Are Doing To-day

Is It Time to Organize the Radio Pioneers' Society?

THE old-time radio bugs—the fellows who started the radio game—and still are in the land of the living, have had no end of amusement during the past few months reading the fine stories telling all about those who launched radio to a hungry public waiting for some new morsel to devour.

A whole lot of names have appeared in the daily papers in connection with radio; but when the old-timer searches his memory, he fails to find any recollection of these birds back in the days when the radio amateur had the ether to himself—

before the days of radiophone broadcasting and Department of Commerce regulations.

All regular old-timers will remember when Thomas E. Clark, back in 1901, issued a handsome catalogue of radio apparatus showing coherer sets with large capacity drums. Clark's radio-telegraph sets were used on lake steamers and at several stations on the Great Lakes, and the very first amateurs had the advantage of Clark station sending to tune up home-made coherer sets.

The first head-phones made especially for radio were turned out by

W. C. Getz, of Baltimore, a telephone engineer. These phones were wound to 2,000 ohms each and had thin rolled gold-iron diaphragms. Getz died in the Philippine Islands, some years ago, where he had gone to do work for the Signal Corps.

C. Brandes, New York, put out a good phone as early as 1909. Brandes was killed in a train wreck, a few years later. His business has been continued and is prosperous.

The first understandable article on radio published in the United States was written by A. F. Collins, and appeared in the "Scientific American" in 1901 or 1902. This article started the ball, as plain instructions were given how to duplicate Mr. Marconi's original experiments.

Mr. Collins published a small radio magazine known as "Collins Wireless Bulletin," and one of the contributors was William Dubilier, who later became well-known radio engineer and successful manufacturer of radio apparatus.

In the New England States, W. W. Massie, at Providence, Rhode Island, got into the game at an early date and had to his credit a string of patents as early as 1905.

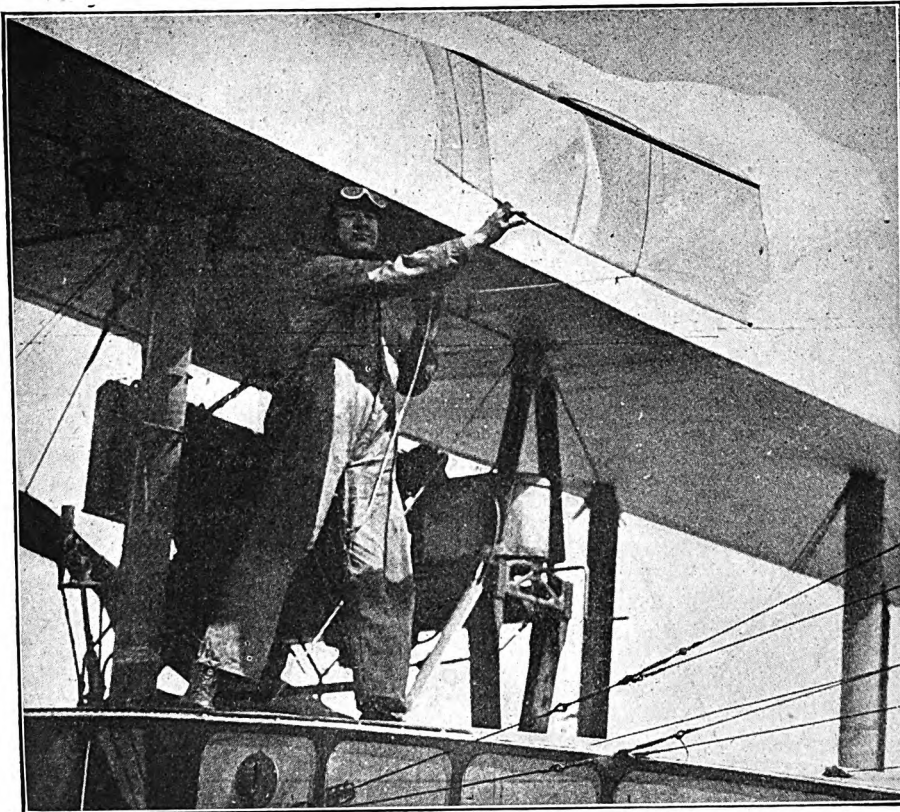
Yea bo! Do you remember the fine articles on radio written in the amateur magazines, radio and mechanical, by John Vincent? This lad was none other than he who is John V. L. Hogan, who, in 1919, became president of the Institute of Radio Engineers, and is, to-day, one of the best-informed radio engineers in the country.

David Sarnoff, who set up the radio station for John Wanamaker, about 1908, is now general manager of the Radio Corporation, and Mr. Gawler, who helped the French-Rochefort concern to get their primitive radio-gear working to suit the Navy, about 1903, is now doing big things for the Radio Corporation of America in New York.

The first radio operator to go down with his ship in performances of duty was George Eccles, a Canadian. Mr. Eccles was lost when the "Ohio" sank off the North Pacific Coast in 1909. His name appears on the fine monument erected to radio heroes and which is situated in Battery Park, New York.

Jack Binns, of the "Republic" and

Kite Device for Airplane Antenna



(c. Underwood & Underwood.)

Heretofore the antenna of the radio equipment of airplanes trailed from the "ship" and became unwieldy and useless when a landing had to be made. Now the antenna trail from a flown kite of the type shown in this picture.

By means of a new radio-invention, lost airplanes will be able to signal their location through an antenna trailing from a kite. Formerly a plane could use its radio only while in the air, where the antenna consisted of 200 or more feet of trailing wire. When the plane was forced to

land, the antenna could not be used.

The new kite-equipment weighs only a few pounds. Each plane carries two kites—for light and strong winds—and a reel of very light antenna-wire. The radio generator develops power for the sending of messages.

"Florida" fame, and John R. Irwin, who accompanied the celebrated correspondent, Walter Wellman, on the first attempt to fly a dirigible across the Atlantic, are still in the game and are well known to radio fans.

John Stone, one of the first American radio engineers to put down in black and white the mathematics of radio phenomena is in New York, and is a keen observer of the great things which have come to radio in recent months.

Charles V. Logwood, who had a Poulsen-arc working as early as 1908, and who later became chief engineer of the De Forest Laboratories, New York, now is in Chicago looking after radio for the educational department of the windy city.

Then there is Donald McNicol, who while but a boy had the earliest operative radio set in the Northwestern States—in Minneapolis in 1901—and who wrote one of the earliest book-length treatises on Wireless (1903). Mr. McNicol, to-day, is a member of the board of directors of the Institute of Radio Engineers, and possesses the largest private collection of radio literature, history, and relics, and is, also, assistant to the president of the Radio Corporation of America, New York.

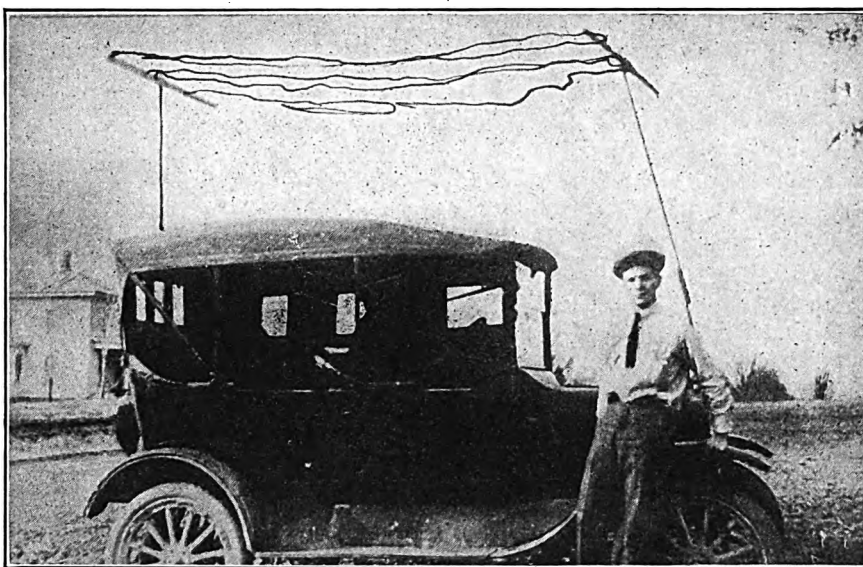
R. H. Marriott, who got the Department of Commerce's radio-inspection service started, is now in charge at the Bremerton, Washington, navy-yard. Phil Edelman, who wrote a book on radio many years ago, is in New York as a practicing engineer. E. N. Pickerill, the first railroad telegrapher to take up radio (about 1905) and who buzzed out good American Morse from old "WA" office, De Forest, on top of the Waldorf-Astoria Hotel for a few years, beginning about 1907, during the late war became a noted airplane-pilot. He is now in the radio game in New York.

Harry Shoemaker, who kept the patent office busy in the early nineteen hundreds, was one of the pioneers who made good contributions to radio. Fred M. Sammis, who was one of the early chief engineers of the American Marconi Company is now with the Westinghouse Company.

The first employed Marconi operator in America was Tom Tierney, who worked the old Nantucket Light station in 1901. Mr. Tierney is now night manager of the New York office of the Postal Telegraph-Cable Company.

Three of the earliest New York radio bugs were George S. De Sousa, Dr. Hudson and Bob Gowen, Mr. De Sousa now is treasurer of the Radio Corporation; Dr. Hudson who had

Michigan "Flivver" Rigged for Radio



(c. Underwood & Underwood.)

"Bud" Slocum, sixteen-year-old student of the Ionia High School, Michigan, has rigged an aerial on his "flivver" so he will not miss any radio messages if he chooses to stop his car. His only drawback must be looking for good ground where he can set up his receiving equipment. Then it will be quite possible for him, with the aid of his overhead wires, to tune in.

New York City to be a Broadcaster

Mayor Hylan has appointed a municipal radio committee to carry out the suggestion regarding control and the possible establishment of a radio broadcasting station by New York City. The committee is composed of Rodman Wanamaker, chairman; Borough President, Maurice E. Connolly; Arthur S. Tuttle, chief engineer of the Board of Estimate; Merrit H. Smith, chief engineer of the Department of Water Supply, Gas and Electricity; Grover A. Whalen, commissioner of plant and structures; Samuel G. Rhodes, of 124 East Fifteenth Street; Sanders A. Wertheim, of 52 Broadway, and Lloyd Espenscheid, of 195 Broadway.

The committee will pay particular attention to recreation and control, and will suggest measures to protect the public against any possibility of

the new medium of communication falling into the hands of a monopoly which might retard its development in the metropolis.

Reception in Radio Telephony

The apparatus ordinarily required for reception in radiotelephony is the same as that ordinarily used for reception in radio telegraphy. The transmitting apparatus, however, differs essentially.

Frequently it is possible to use one of two grounds; but both of them being doubtful, the experimenter is in a quandary as to his selection. In such cases, there is but one rule to follow, and many amateurs who have tried out various ideas have decided to observe that rule: Use of both grounds.

one of the best early transmitting stations, on Riverside Drive, New York City, died some years ago, and Bob Gowen, who later as chief engineer for the De Forest Company carried on the first broadcasting music experiments from his home in Ossining, New York in 1917, is now in China on radio work.

Alex Reoch, who put up early stations along the eastern coast of Canada, is now assistant chief engineer for the Radio Corporation.

Old-timers, this list is not complete,

but includes the names of a few of those whose names figured conspicuously in the amateur radio journals of a dozen years or more ago. The time has about arrived for the formation of a Radio Pioneers Society, to include in its membership those who can by evidence show that they were dabblers in the great game of radio as far back as twenty years ago.

RADIO WORLD would like to hear from the old-timers regarding the proposed society. What is your opinion regarding the new society?

More About Your Storage Battery

How to Install and Operate It. Proper System of Home Charging. The Best Way to Keep It Working Properly

By E. L. Bragdon

IN RADIO WORLD No. 3, dated April 15, the amateur was told how to use his storage battery in order to have it give its best service over a long period. It was explained to him, also, what careless treatment would do to the battery; that although batteries are sturdily built, they must be handled as carefully as any other part of a receiving outfit in order to give satisfaction. In this article, methods will be described by which the storage battery may be charged at home if the owner so desires. The man who uses only one vacuum-tube will seldom find it economical to invest in the added equipment necessary to do his own charging; but the owner of a three or four-tube station can figure that a charging set will soon repay its first cost in its elimination of the bother and delay occasioned by the frequent need for recharging. An outfit consisting of one stage of radio frequency amplification, a V. T., detector and two stages of audio frequency amplification will consume about four amperes. If the set is operated four hours an evening, a 60-ampere-hour battery would have to be recharged after three evening's use.

But by having his own charging equipment available, the battery can be kept charged by hooking it to the line for a few hours each day. This method will keep the battery plates in better condition than when the battery charge is fully depleted before discharging.

System Used in Home Charging

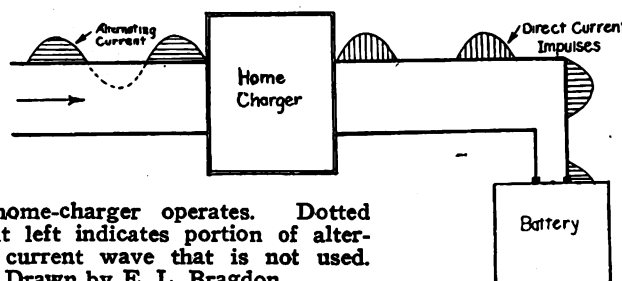
Storage batteries are charged only with direct current. But practically all house-lighting circuits are alternating current lines. Before a battery can be charged, then, it is essential that some way be found to change the alternating current to direct current. This is done in the principal charging outfits by some device that "rectifies" the alternating wave.

The sketch shows the wave form of an alternating current. If this current were connected to a storage battery, those plates which are supposed to be *positive* all the time would be *positive* only half the time. The other half would be negative, thus nullifying the work done by the first half of the cycle and incidentally ruining the plates.

In rectifying an alternating current,

it is necessary to find some way by which the negative half of the wave (noted by dotted line in the accompanying sketch can be turned around so that it flows in a positive direction. Or, if this is not possible or feasible, some way must be found of using only the positive half of the wave. The latter method is the one most frequently used. As can readily be seen by the sketch, this means that there is a part of each cycle when the battery is not being charged but this

but if the plate becomes positive, the current will flow from it to the filament. Knowing this the reader, no doubt, can see how the tube acts to rectify the alternating current. The latter is first positive and then negative. When it is positive, there is a flow of current from plate to filament and then to the battery being charged. But as the cycle changes and the alternating current becomes negative, the flow from plate to filament stops short. Current cannot flow back from



How home-charger operates. Dotted wave at left indicates portion of alternating current wave that is not used. Drawn by E. L. Bragdon.

works no harm. The pulsating direct-current is not as efficient nor as rapid in charging as a constant direct current but otherwise it serves as well.

One Type of Home Charger

It is interesting to notice that one of the most successful of home-charging equipment makes use of the same general type of vacuum tube as is found in radio detector units. The charging tube, however, consists only of a filament and a plate, the grid being omitted. The bulb is filled with one of the rare gases—argon.

When the filament is lighted, it gives off millions of electrons which are negative. If the plate is also negative, there can be no flow of current;

the battery to the line because there is no connection between the filament and the negative plate. Thus we have a case where the battery is charged by spurts of positive electricity.

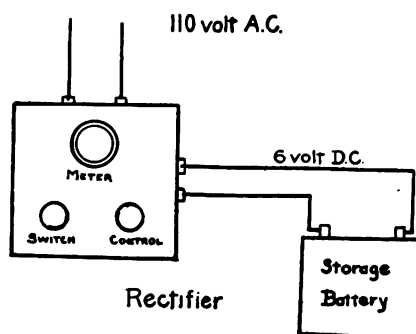
At first thought, it might seem that this method is wasteful since only one-half of the current is used. As a matter of fact, the efficiency is much higher than fifty per cent. The half of the wave not used is not wasted because it is not drawn from the line.

One excellent feature of these home-charging sets is their safety and freedom from trouble. They have been approved by the Board of Fire Underwriters and the owner of an outfit can feel free to leave his battery charging over night or during the day without fearing fire or injury.

A regulating device inside the case of the charger acts automatically if the alternating current supply fails. If this feature were not included, the storage battery would discharge back into the supply line, causing trouble, perhaps, to both line and battery. As it is, if the supply fails the battery is no longer charged; but as soon as the supply is restored the charger commences again to operate and the charging of the battery continued.

How to Install and Operate

As a rule, most of the home chargers are made in a variety of capacities to



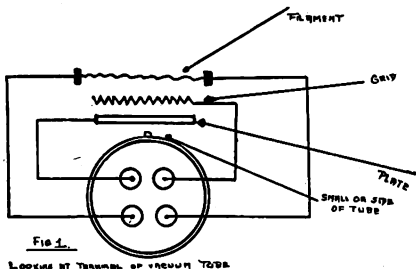
Simple wiring scheme for charging storage battery. Frequent charging with small charges is better than large charges only when battery is exhausted. Drawn E. L. Bragdon.

Vacuum Tube as Applied to Receivers

By *Walter J. Howell*, (Associate Member I. R. E.)

Deputy Radio Inspector

THE vacuum tube is essentially a relay, which means that a small change of current in the input circuit of the tube will cause a big change of current in the output circuit of the tube. A vacuum tube, in general, consists of a filament which is raised to a high temperature by means of a current being sent through it, a grid or screen of wire and a metal plate. The grid is placed between the filament and plate, and the whole incased in a glass tube which is evacuated to a high degree of vacuum. Four connections are brought out to a base, as shown in Fig 1.

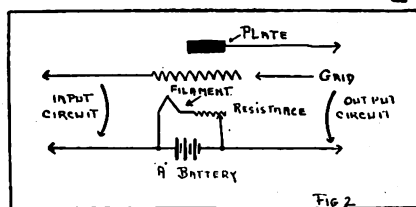


Looking at terminal end of a vacuum tube. Drawn by W. J. Howell.

Fig 2 shows the input circuit which consists of the grid and filament path through the tube and the output circuit

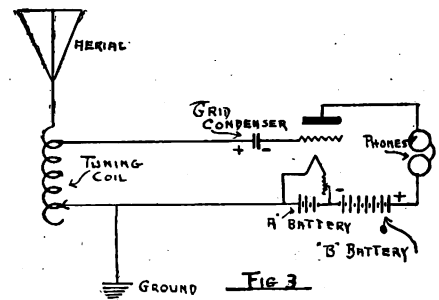
which consists of the plate and filament path through the tube. Current can flow from the grid to the filament, or plate, to the filament, because electrons are being thrown off from the filament when it is raised to a sufficient temperature by means of the current from the battery A. This current is controlled by means of the resistance R., which, in turn, controls the temperature of the filament.

When the input circuit is connected across a coil of wire, or condenser, in a receiving set and the set is adjusted



The input circuit of the tube which consists of the grid and filament, and the output circuit which comprises the plate and filament path. Drawn by W. J. Howell.

to resonance with the sending station, there is impressed across it an alternating electro motive force, or rapidly fluctuating current of electricity. As shown in Fig. 3, the output circuit has a B. Battery and head telephones



Circuit with a conductively coupled coil connected to a vacuum tube detector. Drawn by W. J. Howell.

connected to it. Current is flowing from the positive of the B. Battery through the telephones, plate, filament circuit back to the negative of the battery. There being no change in this plate current you hear nothing, but the moment there is a charge of electricity in the grid the plate current is changed and you hear a sound in the telephones.

Now, a very important point comes up in the action of the tube. The current that is received from the sending station is alternating in character the same as the electric light current used in illuminating homes; but the frequency is beyond audibility and must be rectified before it can be heard. This is done by the input circuit in this manner: The electrons thrown off by the filament are negative; therefore, a positive charge will attract and a negative charge on the grid will repel, so that current can only flow from the grid to the filament. This results in the grid condenser becoming negatively charged which in turn repels electrons and reduces the plate current. This negative charge leaks off quickly, and the input circuit is ready for another impulse.

A Daily Audience of Over a Million

Out of the air come daily news bulletins, lectures, sermons, vocal and instrumental concerts, operas, market reports, government time signals, shipping news, weather forecasts, fashion tips, agricultural reports, church services and children's bed-time stories, says the "Observer," (Charlotte, N. C.)

Radio broadcasting service is available in all parts of the United States. The daily audience that listens in probably numbers more than 1,000,000 people.

(Continued from preceding page)
accommodate the service. A purchaser has his choice of an equipment that will charge his battery rapidly by pushing into it several amperes; or, he may decide to charge over a longer period of time with a lesser number of amperes. In general it is better to follow the notation on the side of the battery case as regards the charging rate. With the 90-ampere-hour radio batteries this will be found to be 4 or 5 amperes.

The outfits are not ponderous or heavy. They may be set on a shelf or fastened to a wall. The latter method is the best to follow.

After attaching to the wall, the alternating current supply wires should be connected to the binding posts so marked. The rectifying bulb should be screwed into its socket. Then the positive pole of the battery should be connected to the (+) post of the charger and the two negative poles together. Usually these devices are equipped with a switch for turning on and off the alternating current—an ammeter for noting the charging current, and a regulating device for regulating the charging current.

After the battery is properly connected to the charger, the switch should be turned. No current will flow until the control handle is moved. The ammeter should be watched as the handle is moved to see that the current is adjusted to the rate demanded by the battery. When this has been done, the charger will automatically continue to charge the battery so long as desired. When the charge is completed, the switch is turned off and the regulating handle returned to its zero position.

There are many types of chargers, but all of them follow the same general procedure. Many new home-charging outfits have made their appearance since the interest in radio became widespread and most of them are well suited to the work. It is always advisable, however, to talk the matter over with a capable electrician before investing in any outfit. Charging equipments, while new to the radio amateur, are old stories to electrical men familiar with the game.

Radio and the Woman



(c. Photograms, N. Y.)

When the Travel Show was the attraction at the Grand Central Palace, New York, radio parties were very much in vogue so far as the many women patrons were concerned. Here is Mrs. Van H. Cartmel and her invited guests. Mrs. Cartmel has just explained the mysteries of the amplitone which she is holding. The others in the party (from left to right) are the Misses L. A. Petra, Mary O. Field, Barbara Brokaw. The three at the back are the Misses Marian de Rham, Alice Beadleston, and Victorine Kellogg.

A BUSINESS WOMAN who goes to her office each day, voices the opinion that some day radio will relieve the tedium of useless hours consumed while riding in the subway. "What a joy it would be!" she exclaims, "if one might obtain the morning or evening news just by leaning back in one's seat and listening, instead of having to glean it with tired eyes from newspaper in badly lighted trains!"

Why doesn't some clever woman design a receiving set with a dainty, artistic exterior? It would have a much stronger appeal to our sex than most of the fearfully mechanical devices displayed.

The report that a New York branch of the Knights of Columbus has voted funds for the installation of a radio outfit at the House of Calvary for incurable patients, and that they intend extending this privilege to other hospitals throughout the country, causes one to ask if the welfare of scores of bedridden women does not mean fully as much to some equally great women's organization.

The window of an attractive tea room in the Forties displays this sign: "Radio concerts given here."

I was motoring out on Long Island the other day. It was just before noon. The chauffeur stopped at a farmhouse to obtain some water. From the front

porch, a buxom housewife smiled at me. More because I wanted something to say than because of any particular interest in the elements, I asked her if some slowly gathering clouds indicated rain. Her reply, if not enlightening at least, showed commendable progressiveness:

"There's no way of knowing for certain," she said, "until my husband returns from town with to-day's radio weather report."

A dear girl who was unable to enter college last year, due to the results of a bad accident, is hopefully looking forward to the series of lecture which New York University has promised will be broadcasted.



(c. Underwood & Underwood)

Just to be in line with everybody who is anybody, Miss Doris Kenyon, the actress, has installed a small radio set in her home. The cameraman caught her in the act of listening in while a concert was coming over the wave lengths.

Motion-picture fans are waiting to hear the voice of some favorite star whose voice they have never heard—who they have only been permitted to see. Can't they have a few words from some such loved one as, say, Norma Talmadge, for instance?

* * *

Any supercilious engineer who might take it upon himself to frown on woman's fitness for this new field, should be reminded of those hundreds of our sex, who, during the war, studied wireless at Columbia and other colleges. If that fact doesn't prove fitness, what does?

* * *

I am awaiting the announcement that some progressive woman's college has arranged a course in radio. High schools and men's colleges have done this. Why haven't ours been heard from?

* * *

My hostess was robust and long past fifty, and so set in her ideas that she was not given to easily believing things. From the depths of a comfortable chair in the old-fashioned parlor of her cozy home some distance from New York, she surveyed me curiously as I told her of this new science. So that she might grasp something of its possibilities, I described how marvelously it brought music into one's home. I recounted the broadcasting stations' programmes; told her about the trip some Cornell boys made on a Lackawanna train from Ithaca to Hoboken, listening to music from the other; described as well as I, myself, understood it, how befogged ships were guided into port; explained how, by its means, human lives are being saved. In fact, knowing she knew nothing of radio, I did my level

best to enlighten her, yet when I paused for breath, and in the hope that my recital had enabled her to understand, she merely sat and looked at me.

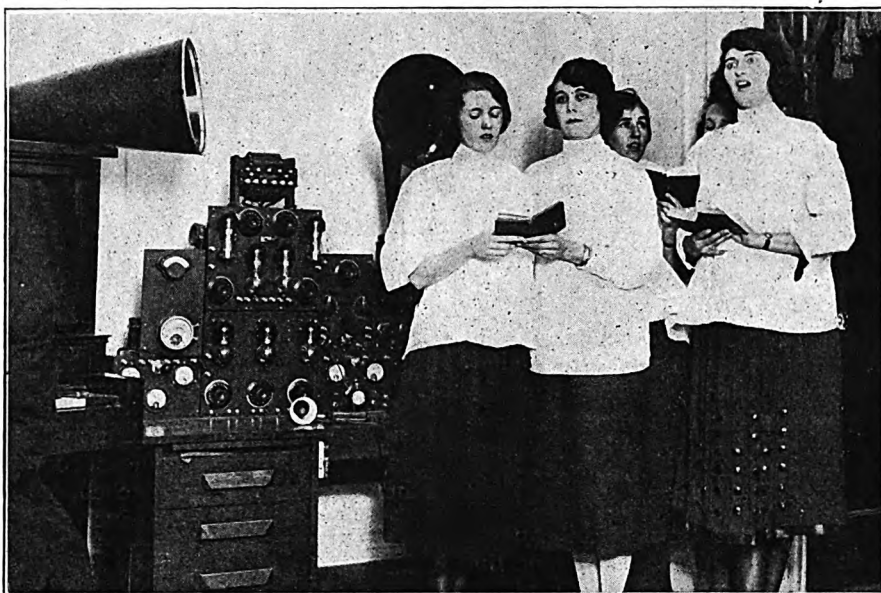
"My dear," she said, suddenly leaning forward, "I want your mother to come here. I shall write her that she must do so."

Just what mother's coming had to do with wireless was more than I could understand, but what I could see, was that she was not inclined to discuss the subject.

Later, when the house was quiet, I stole sleeplessly to the old parlor. An open grate and a candle provided all the warmth and light necessary to read. My glance strayed about for a book till it fell on a letter she had begun writing mother and which had evidently been laid aside for completion next day. Before withdrawing my eyes, I unconsciously read:

"She seems rational enough on all other subjects with the exception of this one she calls 'radio.' Could it be possible, do you think, that that trace of insanity on her great grandmother's side—"

I suppose the time will come when gold and silver-mounted head pieces will be as essentially a part of my lady's home paraphernalia as the present day powder-puff and rouge



(c. Kadel & Herbert News Service, N. Y.)

There is a church choir somewhere in America that sends out sacred songs. Perhaps, if you have been tuning in you have heard these songs, but you have never seen the charming young women whose blended voices waft them through the ether. The choir sings in the home of Walter J. Garvey, who owns the largest amateur radio set in America.

Mrs. W. H. Price, 362 Wadsworth Avenue, New York City, writes that she would like to get into touch with the Women's Radio League of America. Because of my inability to obtain the club's address, I have been unable to supply her with it.

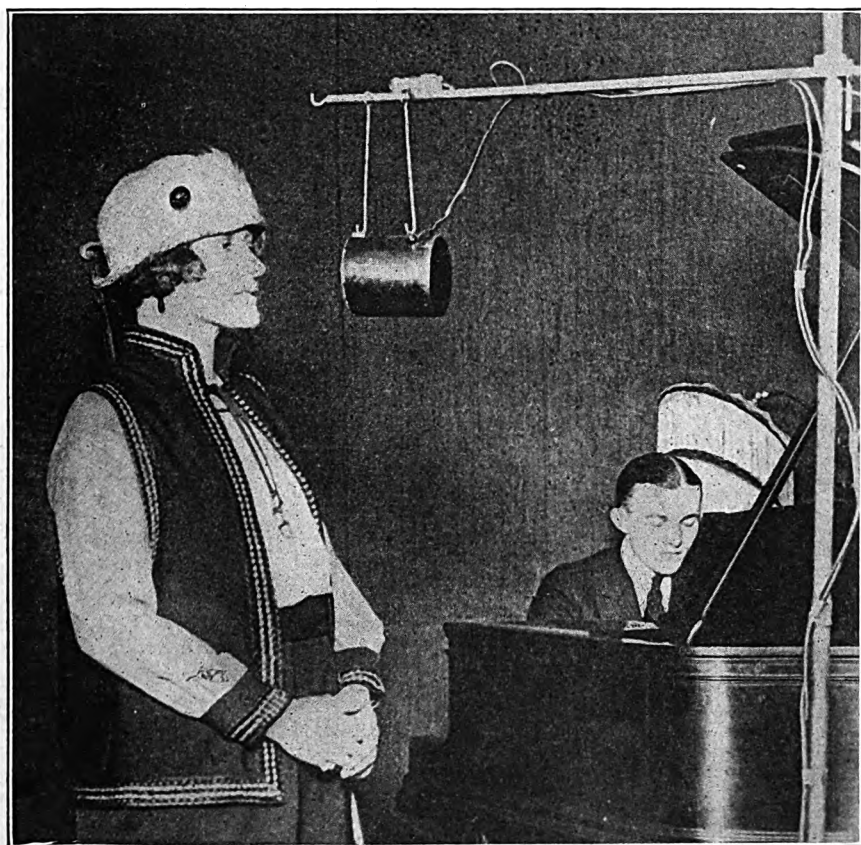
A radiophone receiver adjusted to the ear of the busy housewife, who invariably spends an hour each day preparing fruits and vegetables for the evening meal, is going to relieve the monotony of such work.

Thanks to WJZ, young folks, by only a slight stretch of the imagination, were able to visualize C. E. LeMassena's operetta, "Pandora" recently—so well was it broadcast.

Considering the great amount of interest we women are evincing in radio, wise, indeed, will be the manufacturer who turns out a specially designed head set that will not crush carefully dressed *coiffures* or tear our expensive hairnets.

Would it be too improbable to conjecture that the first receiving-set to be designed by a woman will have a tiny mirror inserted in it somewhere?

It is really wonderful to listen to the radio fans of the gentler sex talk in radio terms. To hear them discuss the new fad and tell all about amplifiers and ohms and regenerative receivers and antenna and vacuum tubes—and all the rest of it; why, one would imagine they were experts. It is remarkable how much they really do know. I heard one fair Fifth Avenue belle at the McAlpin Hotel, the other day, in an argument with a Navy chap. It was about interferences. From the look on his face, she was getting the best of it. Women are going to do a lot to make radio popular. —R. R. G.



(c. Underwood & Underwood)

Miss Louise Forester, of Chicago, is the good fairy who sings thousands of babies to sleep every night. From the Westinghouse station in her city, she broadcasts lullabies that float into thousands of homes equipped with radio. And she has been heard at a number of firesides far away in Canada.

How to Build the Loose Coupler and the Variometer

By Frederick J. Rumford, A. I. E. E.

The Loose Coupler

A VERY simple and efficient piece of radio apparatus namely the loose coupler, is described herewith. It is the next stage in the receiving end of wireless telegraphy, which, not so very long ago, was used by all radio men; but at the present is in use more by beginners; and the writer thinks it best for the beginner to build one as described.

This loose coupler, when built according to directions, is capable of receiving on various wave-lengths from 800 to about 4,000 meters when it has been connected up properly with its associate instruments its range can be increased by the introduction of loading coils and its tuning made more selective by the introduction of an variometer in the antenna circuit.

We will now pass to the actual making of this instrument. First the builder must purchase two gray seamless cardboard tubes of the following dimensions: one 7 inches long and $4\frac{1}{2}$ inches in outside diameter, which will be the primary tube or known as such; the other tube should be 7 inches long and 4 inches in outside

diameter. Both of these tubes should be given a couple of good coats of shellac and left to dry. After they have dried, the primary tube should be wound with No. 30 D.S.C., magnet wire starting one-half inch in and continuing until one-half inch from the other ends has been reached, taking off taps at every one-half inch making a total of 12 taps. After the tube is wound full closely together with No. 34 S.S.C., magnet wire, the winding beginning in one-half inch from the end and continuing until one-half inch is reached from the other end, taking taps off at every inch, which would make a total of 6 taps. This tube should then be given a couple of good coats of shellac and left to dry.

The builder should now build a housing for his primary coil. The back piece should be 7 inches long, 6 inches wide, and $\frac{3}{8}$ of inch thick. The end piece should be 6 inches long, 6 inches wide, $\frac{3}{8}$ of an inch thick. The remaining end-piece should be the same size as the other end. With this one exception, there must be a large hole in its center, 4 inches in diameter, so as this piece will fit over the primary tube end. On the back

end, there must be a round piece fastened to it—the inside diameter of the primary tube. When this is done, the back and the two ends are placed around the primary tube, then the panel must be of bakelite and of the following dimensions: 7 inches, long, 6 inches wide, and $\frac{1}{4}$ of an inch thick. It must be drilled so as to permit the mounting of the following parts: holes for 13 contacts, 2 stops, one at each end of the circuit of contacts, one for the switch lever, and 4 for the binding posts. After this is done, the panel must be given a good rubbing and all the above mentioned parts mounted on its front, and the complete panel mounted on the housing, and the taps from the primary coil connected to their respective contacts. The binding posts must then be connected up to their proper connections.

Now for the secondary tube. There must be 2 round-end pieces big enough in diameter to fit snug into the inside diameter of the secondary tube. These end-pieces must have 2 holes drilled in their centers, $1\frac{1}{2}$ inches apart. Each hole must be large enough to permit the passing through of a $\frac{1}{4}$ -inch brass rod. Two of these rods are necessary, each being 15 inches in length. These rods are to be fastened at the piece of the primary housing, and at the other end by means of a rest, built to suit the builders' own judgment, at the back end of the secondary tube and fastened thereon. The front of the secondary will have the remaining piece as a panel, which should have the following holes drilled in it: 7 holes for the contacts and 1 hole for the switch lever—that is, with the exception of the holes for the brass rods. You should now give the panel a couple of coats of some good insulating-compound. After it has dried, the switch lever and contacts should be mounted on it and the 6 contacts of the secondary connected unto the proper contacts. It should then be fastened to the front end of the secondary coil.

The secondary coil should have its winding-beginning soldered to a little runner which will, in turn, pass back and forth over one of the brass rods forming a connection. The brass rod will have a connection made at its



(c. Keystone View Co.)

Left to right: J. L. Larsen, Captain Raoul Amundsen, explorer; Lieutenant Om-dahl, of the Norwegian Naval Air Service, and Major Scanlon, commandant of Bolling Field, Washington, photographed at Washington, D. C., on Captain Amundsen's arrival by airplane to arrange details for his much heralded flight to the polar regions in which radio will play an important part.

primary end and fastened to one of the binding posts on the primary panel. The connection from the switch lever of the secondary will be connected to a runner and passed over the remaining brass rod which rod will have, at its primary end, a connection which will, in turn, connect to the remaining of the secondary binding-posts.

The whole thing should now be mounted on a large base with the secondary on the two brass rods with which the wave length of the coupler can be changed by the running back and forth of the secondary upon the rods within the primary coil. The housing of the primary coil should have a suitable cover made for it.

The Variometer

DESCRIBED below is a simple and cheap variometer, which has proved to be efficient in receiving circuits. The variometer is often used in conjunction with the loose coupler in the receiving circuit or set. It is hooked-up in series with the aerial, and is used to obtain more selective tuning in the primary circuit. It is more frequently used in regenerative receivers. In this case, two of them are used—one for the grid tuning, the other for the purpose of tuning the plate. The grid and the plate are essential elements in the vacuum tube for detection.

The actual data for making this variometer is as follows: The builder must purchase the following: a gray seamless cardboard tube $4\frac{7}{8}$ inches in outside diameter and $2\frac{1}{2}$ inches in length. The tube will be the primary, or the stator, and another tube as above but with these dimensions: $3\frac{3}{8}$ inches in outside diameter, and 2 inches in length. This tube will be the secondary or the rotator. He must now drill holes through the exact center of both tubes to allow a $3/16$ inch diameter shaft to pass through them. He will then drill two more holes in each tube, at opposite ends, for the fastening of small brass screws and nuts. These will act as binding posts for the starting and the finishing of the windings.

On the primary tube, the winding should start in about $\frac{1}{2}$ inch and continue for $\frac{1}{2}$ inch, making about 24 turns. The winding should again continue on after having left $\frac{1}{2}$ inch space in the center of the tube which would, in turn, permit the shafts to pass through. Then the winding should continue until it has reached $\frac{1}{2}$ inch from the end.

The starting and finishing of these windings are connected to the binding posts mentioned above.

To Study Radiotelegraph Signals

INTERNATIONAL RADIOTELEGRAPHIC CONVENTION

LIST OF ABBREVIATIONS TO BE USED IN RADIO COMMUNICATION

ABBREVIATION.	QUESTION.	ANSWER OR NOTICE.
PBB	Do you wish to communicate by means of the International Signal Code?	I wish to communicate by means of the International Signal Code.
QBA	What ship or coast station is that?	This is
QBB	What is your distance?	My distance is
QBC	What is your true bearing?	My true bearing is degrees.
QBD	Where are you bound for?	I am bound for
QBF	Where are you bound from?	I am bound from
QBG	What line do you belong to?	I belong to the Line.
QBH	What is your wave length in meters?	My wave length is meters.
QBJ	How many words have you to send?	I have words to send.
QBK	How do you receive me?	I am receiving well.
QBL	Are you receiving badly? Shall I send 20?	I am receiving badly. Please send 20.
	..... for adjustment?	..... for adjustment.
QBM	Are you being interfered with?	I am being interfered with.
QBN	Are the atmospheres strong?	Atmospheres are very strong.
QBO	Shall I increase power?	Increase power.
QBP	Shall I decrease power?	Decrease power.
QRQ	Shall I send faster?	Send faster.
QRS	Shall I send slower?	Send slower.
QRT	Shall I stop sending?	Stop sending.
QBU	Have you anything for me?	I have nothing for you.
QBV	Are you ready?	I am ready. All right now.
QBW	Are you busy?	I am busy (or: I am busy with). Please do not interfere.
QRX	Shall I stand by?	Stand by. I will call you when required.
QBY	When will be my turn?	Your turn will be No.
QEZ	Are my signals weak?	Your signals are weak.
QSA	Are my signals strong?	Your signals are strong.
QSB	Is my tone bad?	The tone is bad.
QSC	Is my spark bad?	The spark is bad.
QSD	Is my spacing bad?	Your spacing is bad.
QSF	What is your time?	My time is
	Is transmission to be in alternate order or in series?	Transmission will be in alternate order.
QSG	.....	Transmission will be in series of 5 messages.
QSH	.....	Transmission will be in series of 10 messages.
QSI	What rate shall I collect for	Collect
QSK	Is the last radiogram canceled?	The last radiogram is canceled.
QSL	Did you get my receipt?	Please acknowledge.
QSM	What is your true course?	My true course is degrees.
QSN	Are you in communication with land?	I am not in communication with land.
QSO	Are you in communication with any ship or station (or: with)?	I am in communication with (through
QSP	Shall I inform	Inform that I am calling him.
QSQ	Is calling me?	You are being called by
QSE	Will you forward the radiogram?	I will forward the radiogram.
QST	Have you received the general call?	General call to all stations.
QSU	Please call me when you have finished (or: at o'clock)?	Will call when I have finished.
*QSV	Is public correspondence being handled?	Public correspondence is being handled.
QSW	Shall I increase my spark frequency?	Increase your spark frequency.
QSX	Shall I decrease my spark frequency?	Decrease your spark frequency.
QSY	Shall I send on a wave length of meters?	Let us change to the wave length of meters.
QSZ	.....	Send each word twice. I have difficulty in receiving you.
QTA	.....	Repeat the last radiogram.

*Public correspondence is any radio work, official or private, handled on commercial wave lengths. When an abbreviation is followed by a mark of Interrogation, it refers to the question indicated for that abbreviation.

In order to pass the government examination, an amateur or expert must be familiar with the signals adopted by the International Radiotelegraphic Convention. This is an important question covering a license of communication.

The secondary coil is wound in the same way as the primary coil but with the following exceptions: The winding will start $\frac{1}{4}$ inch in from the edge and finish $\frac{1}{4}$ inch from the other edge, or end, with the usual $\frac{1}{2}$ inch space in the center and the $\frac{1}{2}$ inch winding on each side of the above-mentioned space, with the usual 24 turns per section which would make a total of 48 turns per coil.

Both coils are wound with No. 24 D. C. C. magnet wire.

The builder should then purchase a length of $10/24$ threaded brass-rod. This rod should be forced into the center holes of the above two coils, with nuts. It should be forced up against the inner and outer walls of the secondary at both sides and fastened tight against the walls at both sides of the primary. The coil is then ready to mount and should be given several coats of shellac.

This set is good for about 400 meters; possibly 600 meters.

Radios Speech to Voters 600 Miles Away



(G. International.)

Harry S. New, United States Senator from Indiana, is the first politician to use radio in order to broadcast a speech to his constituents. The apparatus at his left is not the transmitter, but the receiving set through which his hearers sent words of encouragement. The transmitter was located, probably, in the Washington Navy Yard, and was connected by land control to the telephone he is holding. But Secretary of the Navy Denby has since put a stop to political speeches being sent from Washington through the Navy transmitter.

TO Harry S. New, United States Senator from Indiana, falls the distinction of being the first politician to deliver a campaign speech to listening constituents 600 miles away. Senator New proposed to journey from Washington to his home State and take the stump against his opponent for election, former Senator Albert J. Beveridge; but he was obliged to remain in the capital city because of the treaty debate. In order that his supporters should hear his views on the issues at stake, he had his offices equipped with radio apparatus, and by the air route made his appeal for over half an hour. He spoke to thousands of farmers who have telephones in their home. They heard him distinctly.

Senator New talked into the wireless apparatus without any preliminary rehearsing. He hesitated frequently, and those who had transmitting machines sent back words of approval and cheers.

Senator New invited a number of his colleagues to his office to hear him make his long-distance radio appeal. President Harding listened in at the White House radio system.

In order that the delivery might be as simple as possible, Senator New

had written his speech and started to read it into the transmitter; but he soon found the undertaking so easy that he departed frequently from his written words and spoke *extempore*.

Owing to the possibility that Congress may be in session until the middle of August, the news from Washington states that a number of office-seekers will now use the wave lengths to reach their voters. The successful venture of Senator New into radio campaigning has already caused a lot of gossip in political circles. Many are optimistic that campaigning over the air route has already ceased to be a novelty and is a practical proposition. Next fall, the air will buzz with political opinions.

The development of radio has reached a point where addresses not only can be delivered to crowds assembled in some auditorium but to scores of homes in which receiving sets have been installed. The number of amateur and professional receiving sets in this country has gone over the half-million mark. The next six months will see another half million more in use.

Senator New's speech was picked up by stations 800 miles from Washington. He told his hearers that he

regretted but one thing regarding his method of addressing them: that he could not look into their faces.

When the Senator frequently asked if he could be heard distinctly the cry came back: "Yes—go on!"

St. Bernard Dog Has a Formidable Rival

The gallant St. Bernard dog of the Swiss Alps, savior of too ambitious mountain climbers, may soon find a rival in radio.

After twenty years of experimenting, Jean Lacarne, a French engineer, connected with the Valot Observatory on the summit of Mont Blanc, has perfected radio apparatus capable of resisting the severe atmospheric changes of the high altitudes which destroy ordinary wireless instruments.

The suggestion is made that climbing parties carry small wireless outfits so, if necessary, they may obtain quick help through the Mont Blanc observatory.

M. Lacarne hopes soon to be able to communicate with other points in the Alpine region. He has already talked with the Eiffel Tower in Paris.

Army Men of to-day Must Know Radio



(c. Sport Commercial, N. Y.)

Lieutenant Lomax, U. S. A., of the 258th Field Artillery, demonstrating the operation of Signal-Corp radio equipment to one of the numerous classes composed of enlisted men. The importance of radio as an arm of the military forces is reflected by the government's action in instituting a number of courses in radio telegraphy.

Who Thought of Radio First?

WHO invented radio? One might as well ask who invented the locomotive or the automobile.

The man in the street thinks that Marconi was the first man to transmit and receive messages through the ether. Marconi was not the first man to do this.

Back in 1860, one James Maxwell, a Scottish physicist, published a paper on "The Electromagnetic Theory of Light." That marked the beginning of the history of radio, says the New York "Mail." It was the boldest and most perfect piece of mathematical philosophy the world has ever seen. In that paper, Maxwell proved as far as mathematics could prove that electric waves could be produced in the ether. Maxwell did not live to see the great results of his work.

In 1885, Heinrich Hertz, a young experimenter working in the laboratory at the University of Bonn, found

those mysterious waves which had been discovered mathematically by Maxwell. Hertz produced these waves and then detected them. He was the first man to do this.

Marconi came after Hertz. He picked up the loose threads and conducted experiments with the idea of commercializing the thing. He was a practical, hard-working inventor, and he deserves a great deal of credit. However we must not forget the men who paved the way.

After Marconi scores of other inventors made contributions to the art. If it had not been for the work of these other inventors we would not be able to broadcast today, and radio would still be in its infancy. The radio hall of fame has many names in it and plenty of blank spaces have been left for more.

It will contain the names of women as well as the names of men.

Over 5,000 Will Hear at Astor Hotel

The Hotel Astor, New York, has installed a radio equipment which makes it possible for guests to listen to any part of the program of the various broadcasting stations. Not only has this radio equipment been installed, but, also, the loud-speaking apparatus whereby a speaker may address over 5,000 persons in different parts of the hotel. This is the same type of Western Electric Public Address System used by President Harding when making his address at the burial of the Unknown Soldier, at Arlington, on Armistice Day—which was heard throughout the United States.

Keep Your File of Radio World Complete

If you did not get the first three issues of RADIO WORLD, you can get them through the American News Co. and its branches, or send 15 cents per copy to RADIO WORLD CO., 1493 Broadway, New York, N. Y. (Adv.)

The Radio Primer

A. B. C. of Radio for the Beginner Who Must Have the Facts Put Plainly and Tersely, and all Terms Fully Explained

Radio Terms at a Glance

AMPLIFICATION. (*amp-lee-fee-kay-shun*). Meaning to magnify. In radio, the signals, as they are received, are so weak as to make it almost impossible to read them. If the detector is a vacuum tube, then other vacuum tubes can be used to magnify or strengthen the impulses. The detector detects the waves and then they are passed into the amplifying tubes where they are further magnified.

STAGES OF AMPLIFICATION. Each time a vacuum tube is added to a receiving set to strengthen the signals, the set is said to have a "stage of amplification." For example, an outfit having one detector tube and two amplifying tubes is said to be a "two-stage set."

FUNDAMENTAL WAVE-LENGTH. This is the length of the wave an aerial could receive without the aid of other tuning devices such as

tuning coils and condensers. In rough figures, it is equal to the total length of the aerial added to the length of the lead in wire and the length of the ground wire and the total multiplied by one and one-half.

BAKELITE. (*bay-kel-ite*). A patented insulator sold in sheets and tubes. Excellent for radio purposes. Composed of a mixture of phenol and formaldehyde produced by a secret process.

FORMICA. Also a patented insulating-compound of secret formula and manufacturing process.

VARIOCOUPLER. (*vay-ree-o-cup-ler*). A tuning device which consists of one coil of wire rotating inside of a larger coil. Used to adjust the wave length of the receiving set to that of the sending set.

VARIOMETER. (*vay-ree-orm-e-ter*). A tuning device similar in many

respects to the variocoupler, but differing from it in that the inner and outer coils are made continuous by connecting one end of each together. The variometer finds its greatest application in so-called "regenerative sets."

HONEYCOMB COILS. A special form of tuning device in which the wires are wound in many layers but in spiral form, just as string is wound on a ball. This method of winding provides large capacity in a condensed space.

TAP. A "tap" is the connecting wire between one of the turns of a tuning coil and a controlling switch.

PRIMARY. The winding of a tuning coil that is connected to the aerial and ground.

SECONDARY. The winding of a tuning coil that is connected to the detector and head phones.

The Best Aerial for a Receiving Station

By Edward Linwood

What kind of aerial is best for a receiving station?

IT depends on the location and general make-up of the station. If the amateur is located more than fifty miles from any broadcasting station, he should not attempt to receive with anything less than an outdoor aerial consisting of one copper wire, one hundred or more feet in length. If he is within fifty miles and intends to install an outfit with one or more stages of amplification, then an indoor aerial may be considered.

* * *

Why is one wire considered sufficient for a receiving station?

For two reasons: wave length and static. Most amateurs are concerned primarily in the broadcasts which are sent out, with a few exceptions, on 360 meter wave-lengths. To receive these broadcasts most efficiently, demands that the natural wave-length of his aerial should not be over 360

meters. The second reason has to do with radio's greatest enemy—static interference. Static is a local affair, as described in "The Radio Primer" in RADIO WORLD of April 15. Therefore, the greater the network of wires making up the aerial, the greater the static charge on them. Of course, the greater the aerial, the stronger the signals received but not in the same proportion. For these reasons it is best to sacrifice some of the signal strength in order to reduce the intensity of static.

* * *

What is meant by natural wave-length of antenna?

Every aerial has a wave length which it should pick up without any tuning whatsoever. This is the natural or fundamental wave of the aerial.

* * *

What is a tuning coil?

A tuning coil is a length of wire wound around an insulated tube. The wire is copper and ranges in size from

No. 18 to No. 32 B. & S. The length of the wire depends on the number of turns required and the diameter of the coil. The tube may be made of paste-board, fibre, bakelite, formica or any other of the patented composition materials. Metal tubes should never be used. The diameter is usually between $3\frac{1}{2}$ inches and 5 inches.

* * *

What are some of the types of tuning coils?

Beginning with the simplest and working up to the latest and least used types they are: Single slide; double side; switch controlled; loose coupler; variocoupler; variometer and honeycomb, or as it is often called, duo-lateral coil.

* * *

Describe each of these tuning coils?

The single-slide tuner is the most elementary type and supplies the least range of selectivity. It consists of a tube with 50 or more turns of closely spaced copper magnet-wire. One end

The Radio Primer (*Continued*)

Radio Meanings at a Glance

CALIBRATION — To measure and scale off an instrument the measurements of which are unknown with a calibrated instrument whose measurements are known.

CHOKE COIL—A coil that has great self-induction. This choking action is called impedance.

CONTINUOUS WAVE. — This term applies to a wave which has a constant amplitude. It is often called undamped wave.

DETECTOR.—Any device which transforms electrical vibrations set up in an aerial into audible vibrations at the receiving end, is called a detector.

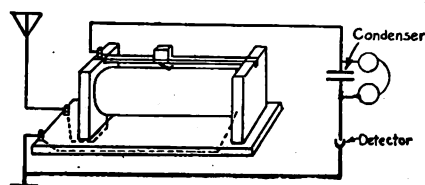
DIRECT CURRENT. — An electric current which flows in one direction only.

E. M. F.—Meaning electromotive force. The unit of the E. M. F., is the volt.

ELECTRONS. — The elementary corpuscle of electricity. In a vacuum tube the electrons are always negative.

(Continued from preceding page)

of the coil is connected to the aerial and the other end to the ground. The slider, which is a contact that slides across the surface of the wires on a bare path scraped through the insulation, is connected to the detector and



Single-slide tuner with wiring diagram. Double-slide tuners have a second slider similar to the first and this slider is connected to the aerial wire. Drawn by E. L. Bragdon.

the lower end of the coil—the same end which was connected to the ground—is connected to the other side of the detector.

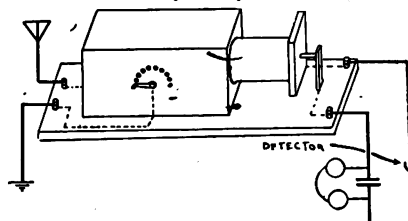
The double-slide tuner is frequently constructed from the same size of tubing and with the same number of turns. It differs from the simple tuner in the addition of another slider. In connecting up this tuner, the aerial is brought to one of the sliders instead of to the coil end. The ground is connected to the lower end of the coil. The remaining slider is connected to one side of the detector and the lower end of the coil is attached to the other binding post of the detector. It will be seen from the foregoing that the detector circuits in both types of tuners are identical, the only change being in the connection of the aerial to one slider.

The switch-controlled tuning coil makes use of a multi-point switch in place of the sliders. In winding the turns on the tube it is arranged so that every tenth turn is connected to a circular switch. These connections to the switch are called "taps." A "tap" is taken off at each tenth turn

until only ten turns remain. From these last ten turns, a tap is taken from each turn and carried to a second circular switch having ten points. With this arrangement, it is possible to use any number of turns desired. Each point on the "tens" switch adds ten turns while each point on the unit switch adds one turn.

The loose coupler is the most efficient and satisfactory of the simpler tuning units. It consists of two tubes wound with wire but with one of the tubes small enough so that it will slide into the larger tube. The winding on the outer tube is connected to the aerial and ground circuit, and is called the "primary." The primary turns may be adjusted by means of a slider or by a multi-point switch. One end of the coil is connected to the ground and the switch to the aerial wire.

There is no metal connection between the primary, and the inner coil called the secondary. The windings on the secondary may be continuous



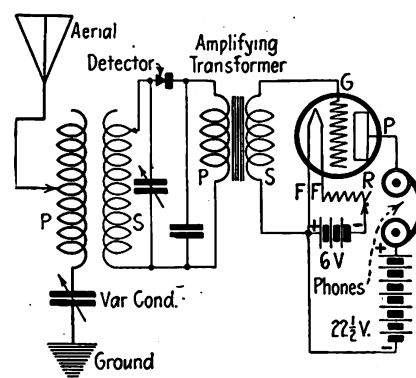
Loose coupler with wiring diagram. By adjusting the primary or the secondary taps, tuning qualities will be obtained. Suggested by Fred. Chas. Ehlert. Drawn by F. Newman.

or they may be "tapped" and connected to a switch. The secondary is arranged on a rod which allows it to slide in and out of the primary. Thus it is possible to tune in two ways: by changing the number of turns or by changing the position of one coil with respect to the other. This feature makes the loose-coupler more valuable where much interference from other sending stations is encountered.

Crystal Receiver and One-Step Amplifier

MANY amateurs wonder if it is possible to use a one-step amplifier with a crystal receiver. Of course, when one is a crystal and the other a tube-amplifier, it would appear to the fan that it is impossible to use them together. However, experienced radio men have proved to us that it can be done.

According to the accompanying diagram, if the amateur purchases the necessary equipment and hooks up the material according to the circuit,



Circuit employing a crystal detector and a one-step tube amplifier. They work fairly well in conjunction with each other. Suggested by Fred. Chas. Ehlert. Drawn by F. J. Newman.

he will find that satisfactory results may be obtained. The amateur must not get overexcited and imagine that this is a regenerative set. It is not.

Nevertheless, with this in view, reliable signal strength may be secured. One drawback will be the proper upkeep of a good point on the crystal, and if this is always obtained, with the proper voltages on filament and plate, signals should be easily heard.

List of Radio Calls

Every radio amateur should have a copy of the pamphlets "Amateur Radio Stations of the United States," and "Commercial and Government Radio Stations of the United States." The price of these pamphlets is fifteen cents, and orders should be sent to the Superintendent of Documents, Washington, D. C. These pamphlets contain lists of the amateur, and commercial and Government transmitting stations in the United States, and of the call letters assigned to the stations; a new edition of each pamphlet is published on June 30 of each year.

Answers to Readers

I enclose a rough diagram of a hook-up I am using. The antenna consists of three No. 14, B & S bare-copper wires, equally spaced on spreaders about 4 feet in length, elevated to a height of from 35 to 40 feet; and well insulated. With this outfit I have been able to hear clearly such stations as Newark, N. J., Pittsburgh, Tarrytown, N. Y., Deal Beach, N. J., and a Western Electric Company station. I often experience considerable difficulty, however, in trying to tune some of the oscillations which I pick up. When attempting to adjust the condensers, I get a lot of howling and cannot seem to eliminate it in order to bring in the signals clearly. At times, this howling occurs as soon as I put my hand anywhere near the coils or condensers.

Can you suggest any improvement in the connections, or advise me what would remedy the above conditions?—F. H. W., Spring Valley, N. Y.

Evidently it seems that you are satisfied with the reception of the concerts with the drawback of what is termed capacity or body effects. To overcome these so-called capacity or body effects and possibly increase the signal strength, sheath your set. That is, line the inside of your cabinet with copper or some metal sheath, grounding one end of it to your ground-binding post. This should answer your problem. When lining, you must remove your instruments, line it up, place back instruments—cutting holes in sheath to allow projecting shafts to come through panel—and then, once again, don't forget to ground it inside your cabinet to ground post. The writer has just noticed that you show a U. V. 201 tube which is an amplifying tube. We suggest that you use a U. V. 200 which is a detector tube.

How many miles from Newark, New Jersey are the following stations?—WJX, WDT, WVP, WCJ, WBZ, WRW?—E. P. S., Downtown Club, Newark, N. J.

The distances are given as follows: WJX, 25 miles; WDT, 20 miles; WVP, 20 miles; WCJ, 50 miles; WBZ, 125 miles; WRW, 50 miles.

I have a short-wave regenerative set with a range of about 1,000 meters. I would like to take in the concerts given by the Fort Wood station at Bedloe's Island, New York, on 1,450 meters. What shall I need to increase my wave-length?—J. M. B., Nyack, N. Y.

Use a duo-lateral coil, size 100, which will cost you about \$1.75, and connect in series with antenna.

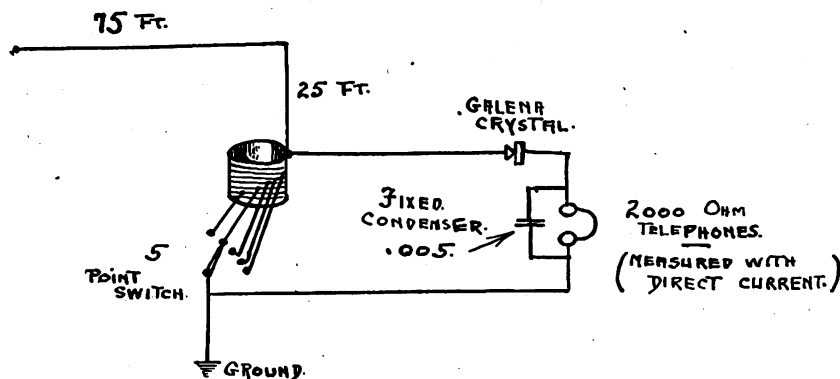


Diagram illustrating reply to R. A. B. A hook-up showing a circuit whereby no dry cells are employed. Merely a galena-crystal pair of phones and coil make up the receiver.

Radio World Will Help You Solve Your Problems

THE editors of **RADIO WORLD** will be glad to answer inquiries from readers. If you are experiencing any trouble with your receiving apparatus, write us. Tell us what your trouble is, what kind of apparatus you are using and any other facts that seem necessary. If you wish to install a receiving set and need advice, write us; but state whether you live in an apartment or a private house and your distance from the nearest broadcasting station. Questions of general interest will be fully answered in this department.

Inquiry Editor, RADIO WORLD,
1493 Broadway, New York City.

Will a variocoupler with both the primary and secondary wound with No. 22 enamelled wire work all right? In a variometer, should the rotor and stator have the same number of turns on it?—G. M., Washington, District of Columbia.

This type variocoupler will work all right with this size wire. The rotor and stator of a variometer should have the same number of turns of wire.

Will a honeycomb coil with 8 taps, 4 layers to a tap, an inch wide, increase the wave length of a regenerative set consisting of a variocoupler and a forty-three-plate condenser with a vacuum-tube detector? Give me hook-up of above.—Charles B. Farmer, Richmond Hill, N. Y.

Honeycomb units are made with primary, secondary and tickler for regeneration. Would advise you to forget about tapped coils and look at a list of different sized coils for various wave lengths. A hook-up sketch of honeycomb coils in this issue shows you the three coils, condensers, and vacuum-tube detector. Any increase in wave length can be accomplished by just shifting to other coils.

Give me a simple hook-up using dry cells for receiving WJZ.—R. A. B., Jersey City, N. J.

Do not use dry cells. You need nothing but a galena crystal, a tuning coil, a fixed condenser and a pair of 2,000-ohm headphones. See the accompanying diagram.

Can I stop a nearby amateur from sending out spark messages?—E. V. E., Staunton, Virginia.

It is impossible for you to stop any amateur from sending if he is legally working on 200 meters and has a licensed station. Don't forget that he has as much right to the air as you have, that there are many amateurs who have been in the game for years and, no doubt, some of these men are carrying on some very important relay traffic messages. It is only fair to the beginner to remember that many amateurs whom they are blaming for this interference are the very ones who made the radiotelephone possible as well as the receivers. A little courtesy on both sides will tend to clear up the misunderstanding.

I live in Brooklyn, and cannot hear anything but code messages. I have a crystal receiver. What is the source of trouble?—G. S., Brooklyn.

Evidently you are located where it is impossible to hear music unless you employ a vacuum tube.

Is the cost of installing a radio set prohibitive?—O. J., Rye, N. Y.

The general advice given by those who have had radio sets for some time, may be misleading in regard to what is required in the way of equipment. The result may be an apparently prohibitive cost. Actually, a simple receiving-set which will copy commercial stations from a distance of 500 miles or more, is quite small. If all necessary instruments are purchased, the cost should be under \$25. When made by the experimenter himself, the cost of material will come to less.

There is no use buying elaborate or expensive instruments at the start. The more costly the equipment the greater the difficulty to operate. There is more pleasure in connecting up a few simple instruments and hearing signals than worrying with elaborate apparatus and getting no results.

Experimenters who are really interested in "What it does and how it does it," find the most satisfaction in mastering the details and operation of each instrument as they add to their stations. That is the way of the logical mind and, under cover of providing for real indoor sport, radio work offers to the younger minds valuable development in logical and analytical thinking—more effective than schoolbook methods since it is accomplished by real entertainment.

What is static?—R. M. New York City.

This term, as used by radio engineers, refers to atmospheric electric effects which produce in radio receiving circuits, currents of a nature to interfere with, or disturb, incoming radio-telegraph and radio-telephone signal. The Standardization Committee of the Institute of Radio Engineers, of which Mr. Donald McNicol is chairman, has defined static thus: "Static is conduction or charging current in the antenna system resulting from physical contact between the antenna and charged bodies or masses of gas."

Owing to the large number of questions received from readers it is impossible to answer all in this number. Your replies will appear in the next or future numbers of Radio World.

The Rosy Future for Radio

By C. W. Horn

Radio Service Department, Westinghouse Electric & Manufacturing Co.

THE present stage of radio broadcasting, while it may seem to the uninitiated to be quite advanced, is really in its infancy.

So far, radio-broadcasting has confined itself to sending out at regular periods some musical entertainments, or perhaps, occasionally some market reports in which, probably, but a small percentage of the listeners are interested. At periods, they broadcast speeches by prominent men and connect into theaters and other places of amusement and broadcast their programs. All this is very interesting, but something more definite will have to come out of all this in order to put broadcasting on its feet and make it part of our everyday life.

Undoubtedly, the business man of the future will glance up at the clock and note that it is 3 o'clock, at which time the stock market has closed, and being interested in a few different issues of stock will throw a small switch and go on with his work while a loud speaker will be reading off the stock reports at the closing of that day's business. When he hears the stocks or bonds, or other securities in

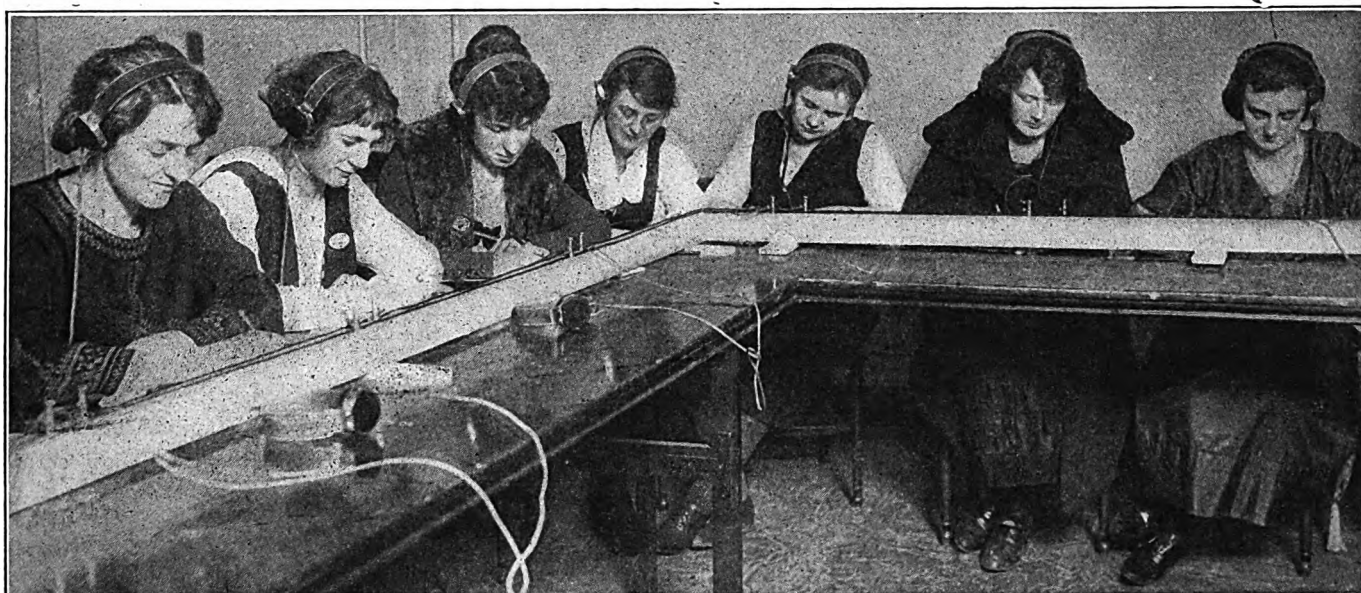
which he is interested he will make a note and when he is through, switch off the apparatus. I firmly believe that in the future a regular ticker service will be inaugurated which will broadcast all sorts of financial and business news on fixed schedules. All that will be required to pick up this information will be a radio receiver installed with a push button to start and stop it.

The future holds much in store for this field of endeavor, and as newspapers and other news agencies are aware. I firmly believe that it will not be many years before people throughout the country will know what is transpiring at Washington and other seats of government; will hear their representatives in the Congress on questions in which they are vitally interested. When this time arrives it will be possible for the constituents of a Senator or Representative to know just how their servant in Congress is behaving himself and whether he is really and truly representing his district, and not merely serving his own ends. Perhaps, and this, I firmly believe, it will really lead up to that ideal point for which we have all

striven, and which was so ably expressed by Abraham Lincoln, "Government of the people, by the people and for the people." When the large portion of the population is fully acquainted with, and keeps itself advised of the activities of its Representatives, and of the questions that come before our government bodies, there will be less tendency toward race prejudice, class wars, etc. The average man knowing what is transpiring, expresses himself in some way or other. The large body of voters, if they should come to the point where they will know what is occurring will likewise express themselves through the ballot, which will result in cleaner government.

"Already radio apparatus has been designed by the Westinghouse Company, which does not require an antenna. Within a few years this apparatus will, undoubtedly, be developed so that it will receive remarkable distances clearly and distinctly, and will be able to avail itself of the privilege of listening in to any desired broadcasting station at will, whenever he feels like it.

Contestants for the First Women's Speed Contest



(c. Sport Commercial, N. Y.)

Competitors for the First Women's Amateur Speed Contest Prize offered at the recent radio exhibition held in the Pennsylvania Hotel, New York. From left to right: Miss Abby Morrison, Mrs. Eleanor Regan, Miss Ruby Yelland, Miss Sonia Soberg, Miss Marion C. Chicken, Miss Beatrice W. Nathan. Miss Yelland was the winner, copying 30½ words per minute without making an error. Miss Chicken was awarded the second prize. Her record was 30½ words per minute, with 4 errors. Learning to read the International Morse Code, better known as the Continental Code, promises to be an attractive occupation for women. Most of them learn the code by means of the key and buzzer system, after graduating into a class where the sounds are picked up and translated through the standard radio head-phones.

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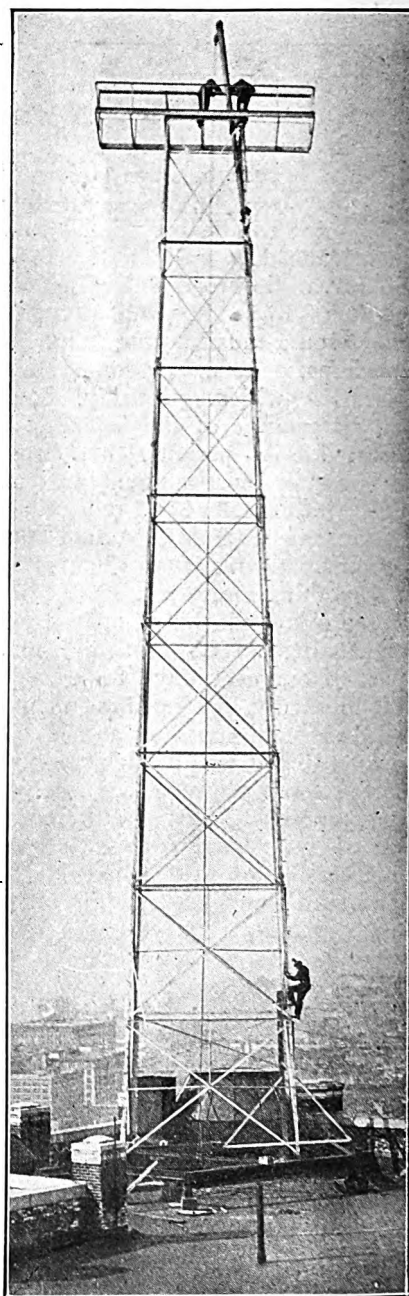
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While every possible care is taken to state correctly matters of fact and opinion in technical and general writings covering the radio field, and every line printed is gone over with a scrupulous regard for the facts, the publisher hereby disclaims any responsibility for statements regarding questions of patents, priority of claims, the proper working out of technical problems, or other matters that may be printed in good faith and on information furnished by those supposed to be trustworthy. This statement is made in good faith and to save time and controversy over matters over which the publisher cannot possibly have control.

Radio Station on New York Skyscraper



(c. International.)

On the roof of the Telephone Building, 24 Walker Street, New York, this 80-foot aerial tower is first being completed. The telephone company is inaugurating a system of radiotelephony particularly for long-distance work. The Telephone Building is one of the tallest skyscrapers in the metropolis.

Radiotorials

Beware of Stock Jobbers

RADIO, with its marvelous growth and numberless ramifications, is, of course, too good a thing for the stock jobbing fraternity to let pass without at least an effort to cash in.

Already there are signs indicating that the smooth gentlemen who deal in stock certificates are endeavoring to make hay while the sun shines.

It is said that a number of curb concerns are trying to induce various companies engaged in the manufacture or handling of radio goods to form new corporations running up into the millions and to place stock on the market for general consumption. There is no reason in the world why legitimate concerns should not organize and sell stock. There are, however, many reasons why the slick gentlemen of the curb should be kept out of the radio field for the good of the science and the business.

It is pretty hard to sell oil stocks just now. In fact, the public is very diffident about investing its money in stocks of any kind, but the brigands of Wall Street hope to be able to get in on the radio craze and to get out again before they are caught.

The legitimate corporations, concerns and individuals having anything

to do with radio at the present time should take particular pains to see that the stock bucaners do not bring discredit on this new line of human activities that is arousing the interest of the whole world. Every stock-selling radio proposition should be thoroughly investigated at its very inception and, if given a clean bill of health, be permitted to continue in the business. But those that do not pass muster and which are being formed merely for the purpose of selling stock without any hope of returns, should be put immediately up to the District Attorney before the public is fleeced.

All this for the honor and dignity of the science and the business.

For Every Member of the Family

Radio is such an extraordinary thing in its relation to American life that RADIO WORLD decided from the first to make each issue of interest to every member of the family. Fathers and mothers, sisters and brothers, large and small, enthusiastic beginner and the seasoned expert, will find in our pages something that is interesting and informative.

We want to regard our thousands

of readers as part of our editorial staff. RADIO WORLD is for you. Let us have your ideas. They are valuable to us. We know our business so well that we are ready and willing to take heed of what our readers want, and then try to give it to them. Enter our editorial council, take a seat at the table and share your ideas with us. You will find we are receptive. You know our address.

Come along!

The "Wireless Hound" Is a Live One



(c. Fotograms, N. Y.)

Mr. Glavin exhibiting his invention at the Hippodrome.

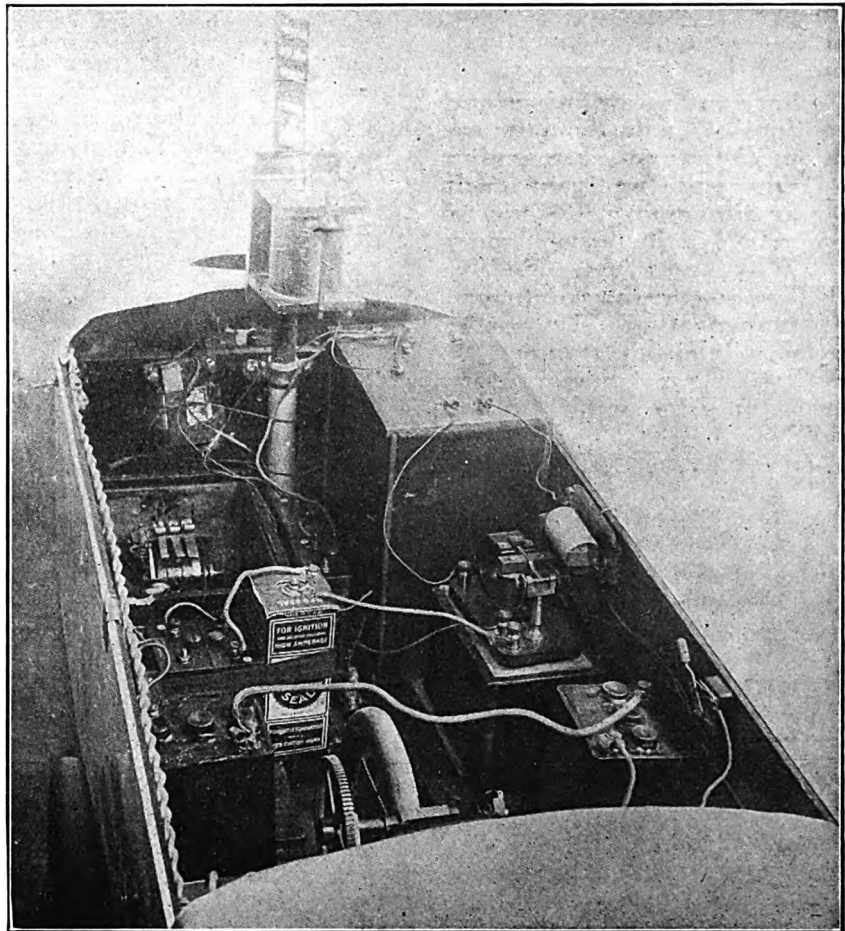
SOME months ago, the "Scientific American" devoted considerable space to an odd little vehicle which since has attracted considerable attention at radio exhibitions, and is now "doing a specialty act" at the Hippodrome, New York. The "hound" is nothing less than a radio-controlled vehicle. It is the invention of Edward S. Glavin, of Yonkers, New York, one of the men who—after Marconi succeeded in getting a coherer to work by means of wireless waves so that distant circles might be controlled as desired—began to experiment in radio-controlled craft. Mr. Glavin's invention represents nine years of constant experimenting and bitter disappointments before he produced a model that actually worked. Applying radio control to a land vehicle found more obstructions than if the craft had been designed for water.

The "wireless hound," says the "Scientific American," is driven by electric motor. The vehicle has four wheels—one in front which does the steering, two wheels which turn freely on a fixed axle, and a center driving-wheel. The electric motor is mounted on a pivoted frame in such a manner that its weight is brought to bear on its rubber-faced pulley pressing down on the driving wheel. Storage batteries furnish the current for the motor as well as for other purposes.

"The control station consists of the usual tuned transmitter—a spark coil, telegraph key, oscillating circuit, and aerial. Each time the key

is depressed, a train of signals is sent out to the aerial of the wireless hound. Each train of signals causes the detector to respond, operating a relay and closing a secondary circuit in a conventional way. The secondary circuit makes use of a control or contact drum carrying various brass strips which, when turned, make various combinations of circuits in conjunction with the brushes or fingers pressing down on them. Thus in the first position the contact or control drum may make the necessary connections for starting the motor. The next position operates part of the electromagnets controlling the steering-wheel, so as to turn the vehicle to the left, while the next position restores the steering-wheel to the normal position and the vehicle straightens its course. The next two positions turn the vehicle to the right and straighten it out. Perhaps the next position stops the vehicle. At any rate that is the way the control operates."

The car moves in any direction in response to signals given by the hand of Mr. Glavin. These signals are translated into electromagnetic radio waves by an assistant.



(c. Keystone View Co.)

Close-up showing details of the interior of the "wireless hound."

Radio Merchandising

A Department of Service for Dealers
Selling Campaigns and Problems

Radio Dealers, Organize!

A PROMINENT radio merchandiser, engineer, and manufacturer, sends RADIO WORLD the following.

"Why not an association of radio dealers? You men, who depend upon radio merchandising for a living, do you believe an angry and hungry unorganized mob can succeed in this great selling-field without your neighbors' co-operation?"

"Are you selling on a close margin, poor discounts, forced heavy overhead demanded by the non-technical radioman known as the radio novice? It costs money and time, lots of it, to sell him and on discounts 10 per cent. and 25 per cent. and so on. Should there be a system in our dealings with the manufacturer and distributors? Whose fault is it that the market is unsettled and remains so—without co-operation? Whose job is it to organize?"

"We have radio exhibitions and conventions of radio amateur associations. Why not a convention of a representative from each dealer in the country. 'Afraid of a monopoly?' is the answer many give. Why not use RADIO WORLD as our medium of dealer-inter-communication. The writer will gladly lend his support toward such an organization, though it may be small and yet helpful."

Will this be the start of the much-needed organization of radio dealers?

There is no doubt that the radio business is growing with such leaps and bounds that an organization, such as our correspondent suggests will be necessary sooner or later.

I. R. C. Newark, Organized

Another nightly wireless entertainment will be broadcasted from Newark, New Jersey, within a few weeks, according to Elmer T. Weight, president of the International Radio Corporation, organized recently with the backing of a group of New York business men.

This corporation, organized under Brooklyn, N. Y.

the State laws of New York and Delaware, proposes to engage in the manufacture of wireless apparatus, the establishment of a laboratory for the development of new wireless inventions and the improvement of present apparatus, the broadcasting of news and entertainment and the establishment of a nation-wide chain of retail wireless-apparatus stores.

It will broadcast under the call "I. R. C." One of the features will be a series of lectures on the operation of wireless receiving and sending sets.

The International Radio Corporation has absorbed the P. W. P. Manufacturing Company, wireless-apparatus manufacturers, and has taken over the building at 42-46 Bramford Place, Newark, to which it has moved its manufacturing plant.

The directors are as follows: Elmer E. Weight, president; Irving K. Partelow, vice-president, a radio engineer; Gerald W. Knight, treasurer; radio and industrial engineer; Thomas Berger, consulting engineer of the Seaboard Construction Company; James H. Curtin, director of the Empire Circuit; John T. McEvoy, diamond importer; Harry D. Burrell of the Russian War Relief, who was formerly associated with the firm of J. P. Morgan and Company; Herman Reiger, Rochester, New York, pulp manufacturer.

Wants Business

A brother-in-law, M. Krauss, The Cincinnati Gas and Electric Supplies Co., 114 West 6th St., N., Cincinnati, has requested that I look up for him local publishers devoted solely to radio and how to erect outfits.

His establishment located for many years in the heart of the shopping district, will, I am sure, afford a good outlet for publications in connection with his new radio department.

Reference: Any prominent local gas and fixture or appliance manufacturer, or your own rating book.

Hoping you will communicate directly with Mr. Krause at your very earliest, sending him sample, prices and particulars, I am, with thanks for immediate attention.—S. S. WOLFF,

Radio Red Book Soon

About May 1 an interesting catalogue, listing dealers who carry radio sets and parts will make its appearance.

The book contains instructions for making three types of radio receiving sets, a map of the broadcasting stations, hints on the care of radio apparatus, the code, how to learn the code easily, symbols, and other interesting data.

Radio Red Book will be published quarterly at twenty-five cents a copy.

Another Big Show

for Brooklyn

The First Annual Radio and Electrical Exposition, under the auspices of the Electrical Contractors Association of the boroughs of Brooklyn and Queens, Greater New York will be held at the Brooklyn Ice Palace, Bedford and Atlantic Avenues, May 6 to May 20, inclusive. Arrangements have been made to install a 2,000-foot aerial so that every exhibitor may be taken care of properly. Manufacturers and dealers at this exhibition will be in direct touch with the buying public and will be privileged to sell their products over the counter.

Complete Outfit for Homes

Editor, RADIO WORLD:

I am in position to place the better radio sets in the better homes. I want to offer the complete outfit. The kind that sounds like a cheap phonograph would not be wanted by the people I have in mind. I know little or nothing about the radio game, and that is why I ask your advice. I want to get started right and can give all my time to the business. I can furnish the best of references.—C. H. McKeown, 505 Bangor Building, Cleveland.

Can Turn Out Wireless Sets

Editor, RADIO WORLD: I have a factory which is adapted to manufacturing for wireless. Can you place me in touch with parties who might take my output. Can rig up to make anything in his line.

G. W. HERBERT

Alexander Hotel, Kittanning, Pa.

Radio Merchandising (Continued)

Will All New Firms Join This List? Clothing Firm Opens

Radio Department

RADIO WORLD wants to keep its Radio Merchandising Department right up to the minute in order that it will be of value to all engaged in every phase of the radio trade—a trade that is increasing daily, that will engage millions in capital create huge payrolls for skilled workers of both sexes, and draw considerable money from the fast-growing army of radio fans; for the day is certain to dawn when, so far as the American home is concerned, radio will be as popular as the phonograph, if not more so.

We begin in this number the publication of a list of dealers and jobbers in radio supplies in the United States. The list is classified by geographical sections, beginning with New England States. This list will be continued from week to week until the entire country has been covered. Watch for the name of your firm in your particular territory. If it is not recorded here, send it in for publication. It may mean business to you. Also send along any trade notes of interest—anything that may be of value to the radio trade. Simply address your letter: "Editor RADIO WORLD, 1493 Broadway, New York City."

New England States

Atlantic Radio Co., 15 Temple St., Portland, Me.
 Mack's Radio Shop, Ansonia, Conn.
 Rocheleau's Store, Baltic, Conn.
 American Hardware Stores, Bridgeport, Conn.
 J. Edw. Brown, Glenbrook, Conn.
 C. S. Tuska Co., 265 High St., Hartford, Conn.
 L. Zimmerman, Box 155, Milford, Conn.
 Ark Radio Supply, 97 Hill St., Shelton, Conn.
 Electric Specialty Co., 211 South St., Stamford, Conn.
 Atlantic Radio Co., 727 Boylston St., Boston, Mass.
 Eastern Radio Institute, 899 Boylston St., Boston, Mass.
 Setn W. Fuller Co., Boston, Mass.
 New England Radio Co., Boston, Mass.
 F. D. Pitts Co., 12 Park Square, Boston, Mass.
 Radio Equipment Co., 630 Washington St., Boston, Mass.
 Somerville Radio Laboratories, 178 Washington St., Boston, Mass.
 Teco Radio Co., P. O. Box 3362, Boston, Mass.
 Ajax Elec. Co. 38 Palmer St., Cambridge, Mass.
 Geo. Hill Co., Inc., Framingham, Mass.
 Lester L. Jenkins, New Bedford, Mass.
 P. J. Stockwell, Box 157-C, Reading, Mass.
 Radio Development Corp., 14 Dwight St., Springfield, Mass.
 Enfield Radio Laboratories, West Upton, Mass.
 W. D. Kendall Co., Worcester, Mass.
 Geo. H. Chase, Newport, R. I.
 Delancey-Felch & Co., Pawtucket, R. I.
 R. I. Elec. Co., 45 Washington St., Providence, R. I.
 Whitall Elec. Co., Westerly, R. I.

North Atlantic States

Wilmington Elec. Specialty Co., 705 Adams St., Wilmington, Del.
 Eastern Radio & Electric Co., 1405 Florida Ave., N. W., Washington, D. C.
 National Radio Institute, Washington, D. C.
 Pearlman's Book Shop, Washington, D. C.
 Radio Instrument Co., Washington, D. C.
 Service Radio School, Washington, D. C.
 White & Boyer Co., Washington, D. C.
 Jones Elec. & Radio Mfg. Co., 120 E. Lexington St., Baltimore, Md.
 Jas. M. Zamoiski Co., 19 N. Liberty St., Baltimore, Md.
 Van Dyke Electrical Co., Asbury Park.

Paramount Radio Supply Co., Arkansas and Pacific Ave., Atlantic City, N. J.
 L. H. Robertson, The Radio Shop, Bloomfield, N. J.
 James B. Howell, Cedarville, N. J.
 Economy Radio Supplies Co., 232 Sanford St., E. Orange, N. J.
 Paramount Radio Laboratories, Glen Ridge, N. J.
 Eagan Radio School, 66 Hudson St., Hoboken, N. J.
 N. J. Radio Equipment & Installation Co., 120 Bidwell Ave., Jersey City, N. J.
 Atlantic & Pacific Radio Supplies Co., 8 Kirk Place, Newark, N. J.
 L. Bamberger & Co., Newark, N. J.
 A. H. Corwin & Co., 4 W. Park St., Newark, N. J.
 Newark Wireless Exchange, 87 Halsey St., Newark, N. J.
 N. J. Wireless Telephone Co., 587 Broad St., Newark, N. J.
 Paragon Elec. Co., 215 N. 6th St., B., Newark, N. J.
 Radio Distributing Co., Newark, N. J.
 Storm-Lee Radio Apparatus Co., 742 Highland Ave., Newark, N. J.
 Geo. N. DeLaplaine, 306 George St., New Brunswick, N. J.
 (To be continued next week)

The Saks and Company of Washington, D. C., sister concern of the New York establishment of Saks and Company, clothing dealers, have established a complete radio-department under the management of Harvey H. Mitchell. Mr. Mitchell, well-known in the commercial and merchandising radio field is well qualified for the managership, having served in the United States Naval Radio service NAA at Arlington and many other important navy stations. He was formerly instructor of theory and operating at The United States Naval Radio School, Great Lakes Training Station, Illinois, a member of many radio and technical associations and clubs. Charles C. Tessier of Los Angeles, California, has come as Mr. Mitchell's assistant.

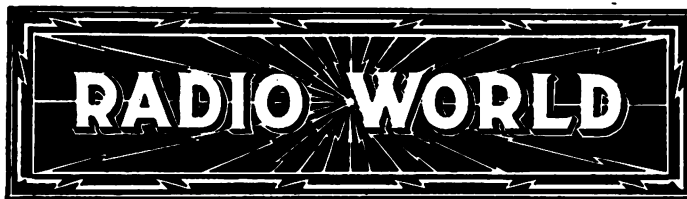
The Saks and Company of Washington wish to announce to the radio merchandising field that they are in the market for equipment.

In the Front Line

Editor, RADIO WORLD: I bought the first edition of RADIO WORLD today, and have just finished reading it. I believe your magazine, in a few months, will be in the front line of the radio publications.

I have always wished for a weekly publication on radio and it has come,
LAWRENCE R. NIELSEN
 Brooklyn, N. Y.

SUBSCRIPTION BLANK



RADIO WORLD CO.,

Putnam Building,

1493 Broadway, New York City.

Please send me RADIO WORLD for.....months, for which

please find enclosed \$.....

SUBSCRIPTION RATES:

Single Copy	\$.15	.....
Three Months	1.50	.....
Six Months	3.00	.....
One Year (including Special Nos.)	6.00	.....
Postage Paid .....		.....
Add \$1.00 a Year for Foreign and Canadian Postage .....		.....

Radio Merchandising (Continued)

New Radio Corporations and Firms

Benson Co., Wilmington, Del., radio equipment, \$100,000. (Corporation Trust Co. of America.)

Beaumont Radiophone Corp., Wilmington, Del., apparatus, \$250,000. (Corporation Trust Co. of America.)

Allen D. Cardwell Mfg. Corp., Brooklyn, N. Y., make radio apparatus, \$500,000; F. L. Carver, C. E. Prettyman, M. M. Messenger. (Attorneys, Zarbiskie, Sage, Gray & Todd, 49 Wall St., New York, N. Y.)

Manhattan Radio Sales Co., Manhattan, \$10,000; R. Lichtenberg, I. Katz. (Attorney, M. E. Levine, 299 Broadway, New York, N. Y.)

Radio Apparatus Development Corp., Manhattan, \$20,000; G. E. Brown, M. Kracmer. (Attorney, J. J. Hegt, 126 Liberty St., New York, U. Y.)

Rochester Radio Corp., Rochester, N. Y., \$45,000; H. B. Graves, Jr., J. V. Harrison, A. H. Holman. (Attorney, A. Neary, Rochester.)

American Radio Exhibitors Association, Wilmington, Del., \$100,000. (Corporation Trust Company of America.)

New Era Wireless Corp., Manhattan, \$300,000; C. R. Collins, R. Wright, A. G. Werther. (Attorneys, LaGuardia, Sapinsky & Amster, 276 5th Ave., New York City.)

Radio Sales and Service Co., Wilmington, Del., apparatus, \$100,000. (Corporation Trust Company of America.)

J. Roy Hunt, Queens, radio equipment, \$25,000; J. R. Hunt, S. F. Katz, A. G. Steiner. (Attorneys, Ernst, Fox & Kane, 25 West 42nd St., New York, N. Y.)

Oneonta Storage Battery Corp., Oneonta, N. Y., \$250,000; E. W. Elmore, D. Franklin, A. A. Hobbs. (Attorney, O. C. Becker, Oneonta, N. Y.)

Omnus Electric Corp., Brooklyn, electric parts and radio machines, \$50,000; B. E. Steinbeck, L. Sherman. (Attorney, J. J. Porte, 1540 Broadway, New York, N. Y.)

Victor Radio Corp., Manhattan, \$10,000, A. and A. Lyons, E. G. Schloss. (Attorneys Lind & Pfeffer, 46 Cedar St., New York, Star Radio Corp., Bronx, \$10,000; J. O. and O. A. Pedersen. (Attorney, O. E. Davis, 3208 Third Ave., New York, N. Y.)

Aerophone Radio Corp., Wilmington, Del., apparatus, \$1,000,000. (Delaware Registration Trust Co.)

Schenectady Radio Corp., Schenectady, N. Y., \$7,500; J. B. Underhill, W. W. Wemple, Jr., A. V. V. Ball. (Attorneys, Wemple & Veeder, Schenectady.)

Dolith Radio Mfg. Corp., Manhattan, \$5,000; R. S. Barthelmess, C. E. Doll, H. M. Smith. (Attorney, C. S. Flanders, 342 Madison Ave., New York, N. Y.)

Clabert Radio Co., Wilmington, Del., apparatus, \$10,000. (Corporation Trust Co. of America.)

American Electrical Appliances and Equipment Corp., Manhattan, \$10,000; C. B. Hayward, A. S. Smith, F. Sheppard. (Attorneys, Begg, Begg & Begg, 220 Broadway, New York, N. Y.)

Radio Electric Co., Manhattan, \$1,000 to \$275,000.

Spark Electric Corp., Manhattan, \$5,000; H. B. Birnbaum, P. J. Candean Jr. (Attorney, J. P. Mottur, 111 Broadway.)

William Thomas, 7740 Santa Monica Boulevard, Hollywood, Calif.

Coast Electric Co., J. Frank Munro, Ralph J. Zink, and Hans S. Onstad, incorporators, San Diego, Calif.

Central Electric Supply Company, Inc., care of Whitehead & Vogle, 315 Colorado Building, Denver, Colo. E. V. Beck and others.

Charles H. Stratton and Perry Davis, Main St., Nicholasville, Jessamine Co., Ky. Herbert Hall, Sanford, York Co., Me. Bought out Bodwell Brothers electrical business which he will continue.

Pearl Ignition Co., 207 West Newton St., Boston.

Boston Automatic Electric Service Corp. Albert A. Gouldhardt, 9-A Monument Square, Charlestown, Mass.

Louis Schremser, 46 Deslaurier Ave., Webster, Worcester Co., Mass.

R. Engles, Forest Lake, Washington Co., Minn. G. Engles.

Thor Electric Shop, 830 Nicollet Ave., Minneapolis, Minn.

R. E. Parsons, 1322 Main St., Kansas City, Mo.

Incandescent Supply Company, 1118 Olive St., St. Louis, Mo.

Asbury Park Electric Supply Co., 604 Bangs Ave., Asbury Park, N. J. E. Jones, Bradley Beach, N. J., and others.

Waterbury Electric Company, 187 North Main St., Waterbury, Conn., now conducted by Solomon Leone, who established business some years ago and from which Max Baruche has recently retired.

Electrical Contracting & Supply Co., 119 North Mywan St., Rockford, Ill.

Hoosier-Hydro-Electric Co. John A. Shafer, 310 Odd Fellows Building, and others, Indianapolis, Ind.

Noble Electric Shop. Charles Noble, 731 Lincoln Way, South Bend, Ind.

James Cusack Electric Co., 313 Third Ave., Cedar Rapids, Iowa.

Home Electric Appliance Company, 15 Main St., Zanesville, O., successor to Herschel Jackson and Herbert Horn, who are still associated with the company. P. H. Ludman, president; F. J. Albert, vice-president; B. T. Jackson, second vice-president; Herbert F. Horn, secretary; Herschel Jackson, general manager.

Interurban Electric Company, Mount Eaton, Wayne Co., O. Old concern, recently incorporated with capital stock of \$100,000. Also power plant.

Gross Electric Fixture Company, 136 Summit St., Toledo, O. Incorporators, George and Sam Gross, Albert Vandenplas, William H. McLellan and S. L. Geeleerd. Also manufacturers.

Morrow Radio Company, Springfield, O. Incorporators, Lorentz A. Morrow, Richard McNett, Louis E. Bauer, William Bruce, Jr., John Morrow.

A. S. Reed Electric Company, 42 Center St., Rutland, Vt. Company has taken over a three story building, and enlarged quarters.

Dodge Sound Amplifiers, Brooklyn, wireless apparatus, \$50,000; C. J. Dodge, E. F. Quinn. (Attorney, H. McInness, 63 Wall St.)

Commonwealth Radio Corp., Wilmington, Del., apparatus, \$500,000. (American Guarantee and Trust Co.)

Annual Report of Radio Corporation

THE trans-atlantic circuits of the Radio Corporation of America are now carrying 20 per cent. of the international message traffic between the United States and Europe. This is announced in the annual report of the corporation to the stockholders made public April 12.

Out of a gross income of \$4,160,844, in 1921, the corporation made a net profit of \$426,799, which amount was applied against reserves for depreciation of patents. This amount, in the opinion of the directors, was inadequate. The balance sheet as of December 31, 1921, shows a book value for the common stock of \$2.11 a share. The corporation has, outstanding, 3,955,974 shares of preferred stock (par value \$5) and 5,732,000 shares of common stock of no par value.

"The year 1921," the corporation reports, "was largely devoted to increasing the efficiency and capacity of our existing

communication channels and to extending, through present European correspondents, connections with other countries by wire telegraph, and thus there has been provided indirect service to almost the entire world, except South America."

Six direct international radio-communication circuits are now in operation by the Radio Corporation of America: Great Britain, opened March 1, 1920; Norway, opened May 17, 1920; Germany, two circuits, the first opened August 1, 1920, and the second May 19, 1921; France, opened December 14, 1920; Hawaii and Japan, opened March 1, 1920.

At the beginning of 1921, the corporation had in operation two trans-atlantic high-power transmitting stations, one at New Brunswick, New Jersey, and the other at Marion, Mass. The station at Tuckerton, New Jersey, originally constructed by a German company, was of unsatisfactory design to meet the demands of transatlantic

service. The reconstruction of this station by the Radio Corporation of America made it ready for commercial traffic in January, 1921. The Tuckerton station now furnishes two transmitters for use on two distinct European circuits.

At Radio Central, Rocky Point, Long Island, construction work, commenced during the previous year, was completed to such a point that, on November 5, 1921, the station was officially opened. When completed, this station will be a multiple station of twelve units, each consisting of a complete transmitter, and an antenna nearly one and a half miles long, supported by six steel towers, each 400 feet in height.

The first unit of Radio Central was formerly opened by President Harding. The message was acknowledged by nineteen countries of the world, including Japan, Australia and New Zealand.

The installation of high-power stations in South America has been inaugurated, by

(Continued from Preceding Page)

joint arrangement with the French, German, and English companies, under which the interests of the four companies are trusted, with an American chairman chosen by the Radio Corporation of America. A station is now being erected in Argentina, and a concession has been obtained and financial commitments made in Brazil. At Warsaw, Poland, the Radio Corporation of America is now erecting a high-power station. One-half of the necessary radio equipment has been forwarded to Poland from the United States, and American engineers are making the installation.

The new receiving-station for trans-Atlantic radiograms is at Riverhead, Long Island, where the one antenna consists of two copper wires nine miles long strung on telephone poles, and receives simultaneously messages from Europe.

Trans-Atlantic transmission and reception of radiograms is now concentrated in one room in the central radio office at 64 Broad Street, New York, providing direct communication between the financial district and the European stations. "Radiogram travel at the speed of light," the report explains. For communication with ships on the Atlantic and Pacific, six marine radio stations are now in operation: Chatham, and Siasconset, Massachusetts; New London, Connecticut; New York; Cape May, New Jersey; and San Francisco. In addition to the regular commercial service, these marine stations also provide a daily news service to ocean liners, daily public reports of the positions of ships at sea, and, in co-operation with the United States Public Health Service and the Seamen's Church Institute, free medical advice for mariners. Recent tests have

given telephone communication between ships and shore over distance of 400 miles, while radiograms are sent to ocean liners up to 2,500 to 3,000 miles.

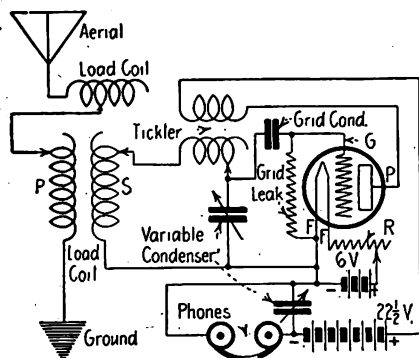
As a result of the erection of radiotelephone broadcasting-stations in various parts of the United States, the Radio Corporation reports a very great demand for radiotelephone receiving-apparatus. "The demand," the report states, "came up very much overnight and no apparatus had been developed which lent itself to quantity production. Radio as an art is advancing very rapidly. Due to the continuous research that has been carried on, apparatus embodying the latest improvements and of a character suited for general use, has now been developed for manufacture in large quantities, and it is believed by the officers of the corporation that the demand, large though it may be, will soon be filled."

The corporation's operating account for 1921 shows gross income from transoceanic communication, \$2,138,625; from sales, \$1,468,919; from marine service, \$533,298. Total, \$4,160,844. The operating and administrative expenses, depreciation of plant and cost of sales totalled \$3,762,231. Other income amounted to \$28,186. The net profit, applied against amortization of patents, was \$426,799.

The corporation's balance sheet shows assets of \$35,712,084, as follows: plant and equipment, \$12,702,086; patents, patent rights, contracts, goodwill, etc., \$16,584,845; stocks of subsidiary and associated companies, \$598,000; current assets, \$4,910,923; deferred charges, \$916,228. The liabilities are: preferred stock (\$5 par value) \$19,779,870; common stock (no par value) \$12,039,607; current liabilities, \$954,471; deferred liability, \$620,000; reserves for depreciation, \$2,318,135.

Receiver for Long Waves

THE accompanying diagram illustrates a regenerative circuit for long waves. Without a question as to the diagram and story, the writer



Regenerative circuit employing tickler coil and loading coil for long waves. Suggested by Fred. Chas. Ehler. Drawn by F. Newman.

knows that, many amateurs are looking for some receiver along these lines. The circuit represents a long-wave regenerative circuit. A loading coil is connected in series to the primary of the primary circuit while in series with the grid of the secondary circuit, employed on tickler coupling. The corresponding tickler coil is shown in the plate circuit. With the proper

coupling of the tickler coils, undamped and regenerative waves are produced. This is an exceptionally good Armstrong long-wave hook-up for the radio experimenter who wants a good workable, efficient receiver.

Radio and Sea Planes

Radio has saved thousands of lives on the sea, says the "Mail," New York. In 1902, the S. S. "Philadelphia" was provided with radio for emergency. In 1912, a law was passed that made it necessary for ocean-going vessels to carry a radio station.

Last week, a seaplane set out from Miami, Fla., to Bimini. It carried seven persons. The plane developed trouble en route, as planes often do, and it had to alight upon troubled waters. In a few hours it was at the mercy of a restless sea.

What happened to its wireless apparatus? It did not have any! If it had been provided with a low-power transmitter, all of the passengers would have been saved. A few SOS signals would have brought plenty of assistance.

Does Mr. Hoover know that seaplanes are allowed to carry passengers over forty miles of watery waste without a radio outfit?

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Thanks to the Magnavox Radio, any receiving set will now serve the entire family — reproducing loud and clear the splendid programs broadcasted daily in all parts of the country.

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Any radio dealer will demonstrate for you, or write to us for descriptive booklet and name of nearest dealer.

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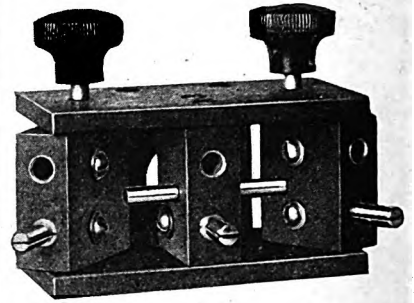
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Much common sense or tact,
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Of intellect to show,
But none the less most roosters have
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The mule, the most despised of beasts,
Has a persistent way
Of letting folks know he's around
By his insistent bray.
The busy little bees they buzz,
Bulls bellow and cows moo,
The watchdogs bark, the ganders quack,
And doves and pigeons coo.
The peacock spreads his tail and squaks,
Pigs squeal and robins sing
And even serpents know enough
To hiss before they sting.
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FREDERICK J. RUMFORD,
A. M., A. I. E. E.
Roxbury, Mass.

Change in Call Letter

Governors Island, N. Y.

Editor, RADIO WORLD,

In connection with the Fort Wood
Signal Corps Station radiophone
broadcast, you are advised that the
call letter of this station, formerly
"W Y C B" has been changed to
"W V P."

Upon receipt of this communica-
tion, it is requested that the caption
"W Y C B" no longer be used and in
lieu thereof, call letters "W V P" be
inserted at the head of each broad-
cast program.

The above change in call letters was
made effective March 17, 1922, at
1:00 A. M.

Thanking you for past favors and
trusting that the corrections will be
made in the columns of your paper.

Yours very truly,
C. J. McBREARTY,
Secretary

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Carrying Power of C. W.

THE new form of radio transmission, known as the "Continuous-wave" or "C. W." method is described by Pierre Boucheron, in an article entitled "At the Sending End of Radio" in the "Scientific American."

"This new system," writes Mr. Boucheron, has made great strides within the past year, owing to its remarkable carrying powers, selectivity, simplicity and low cost, as compared with the older spark type transmitter.

Briefly, the difference between the continuous-wave and the discontinuous or damped-wave method is this: In C. W. we have a system of transmission which generates and propagates a perfectly uniform wave of constant amplitude. Such a wave, after leaving the antenna, travels through space without losing its form. The distance this kind of wave will travel is, of course, entirely dependent upon the amount of power at the initial source. Modern C. W. may be obtained by several distinctly different methods. The most popular method, at least among amateurs, is realized through the use of the oscillating vacuum tube. Here we have the somewhat magical performance of a glowing incandescent lamp generating a constant supply of high-frequency oscillations, which is ideally suited to radiation purposes through the simple expedient of controlling the electronic flow occurring between the lighted filament and a surrounding plate charged with positive electricity.

In the discontinuous or damped method the emitted wave is not continuous in its passage through the ether. Furthermore, the amplitude of its oscillations is not constant. Instead, after such waves have been given their first send-off by the initial power stroke of the transmitter, they rise to sudden great height and gradually fall lower and lower in amplitude until damped out completely. The next stroke of transmitter energy causes them to rise again, and the rising and falling process keeps on indefinitely, depending on the amount of energy back of it. Thus this sort of discontinuous or damped wave, as it is technically called, travels through space until exhausted; likewise, its "carrying" powers are entirely proportional of its initial amount of energy. It is produced by the spark type of transmitter and has been in use ever since the inception of wireless communication.

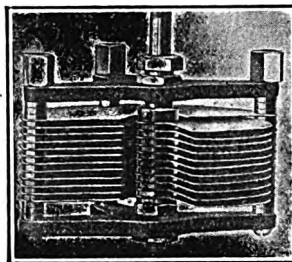
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The rate for this RADIO WORLD QUICK ACTION CLASSIFIED AD. DEPT. is 5c. per word (minimum of 10 words, including address), 10% discount for 4 consecutive insertions, 15% for 13 consecutive insertions (3 months). Changes will be made in standing classified advs., if copy is received at this office before 4 P. M. on any Thursday preceding date of publication. RADIO WORLD CO., 1493 Broadway, New York City. (Phone, Bryant 4796.)

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Plans, instructions in wiring, tuning and receiving, cost of each part, sent for 5 cents. This information will save you many dollars and much time. No amateur can afford to be without it. Explained in very simple terms. Radio Engineers, Box 354, Hornell, N. Y.

Battery Charging Panel Including Volt and Amp. Meters, Circuit Breaker. Will give 30 Amp. Charge \$50. 151 Grates Ave., B'klyn. Tel. Prospect 9144.

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Audion receivers direct from manufacturer, handsome cabinet, bakelite panel and dials, 150 meters to 3,000 meters. \$29.50 unassembled \$20 postpaid. Crystal sets in cabinet \$10 unassembled \$7 postpaid. Stamp for full details of these and other outfits, dealers supplied, agents wanted. Edward T. Collins, 8522-101 Richmond Hill, L. I., N. Y.

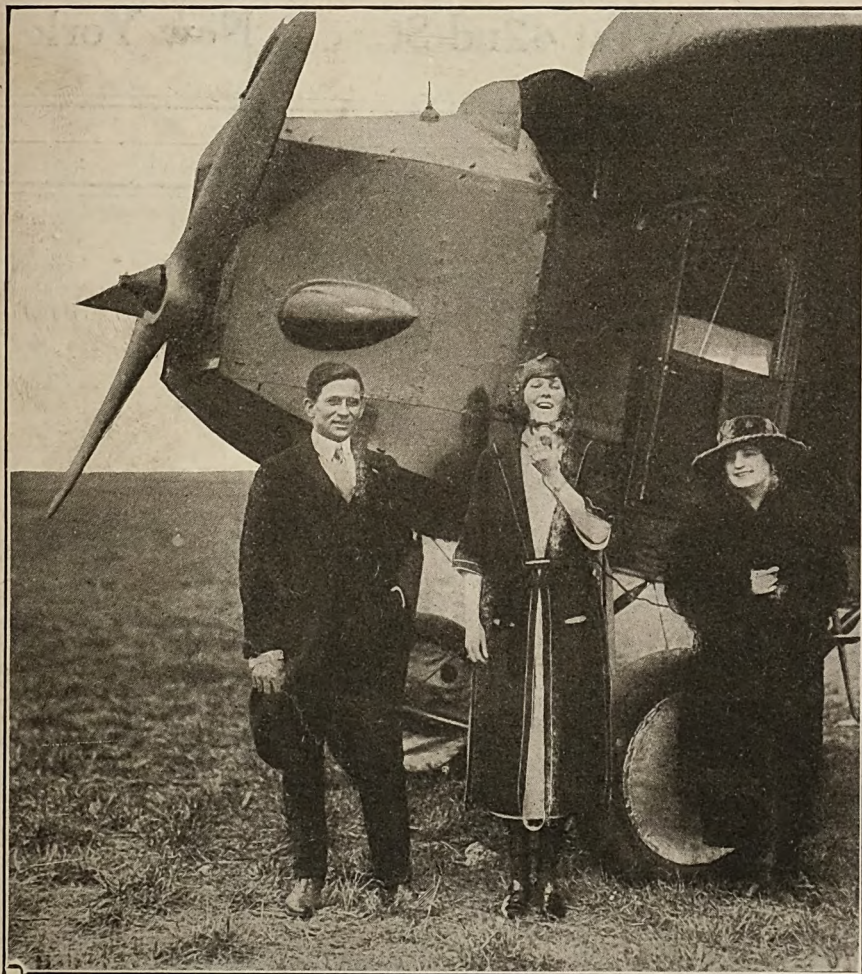
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I have a complete radiophone for sale, 150-1000 meters. Three vacuum tubes, batteries, phones. Fischer, 979 Second Ave., New York.

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Vol. I. No. 5.

April 29, 1922

15c. per copy, \$6.00 a year



(c. Underwood & Underwood.)

The high-powered passenger Fokker, piloted by Bert Acosta, in which Dr. Maynard, Miss Vreeland and Miss Magrane, pictured on our front cover, broadcasted on 507 meters using a 50-watt, General Electric tube-transmitter.



(c. International.)

Moving-picture performers and other cinema workers at the numerous studios in Holloywood, California, derive much pleasure listening in during their idle moments.

Earl C. Hanson

Inventor of the Vactuphone and the Audio Piloting System for Vessels

By George H. Flint

THE remarkable development of radio, during recent years, has been largely due, declare experts, to the introduction and improvement of a little instrument, the invention of Mr. Lee De Forest. The inventor originally named it "audion." British writers have referred to it as "ionic valve" or "thermionic valve." In America it is known as the "vacuum tube" or "electric tube." In popular parlance, it might be called the "little miracle worker."

With this little instrument, Earl C. Hanson, inventor of the vactuphone, plans to do some wonderful things. The vactuphone is an instrument for aiding the deaf. Mr. Hanson is also the inventor of the apparatus which enables vessels to enter and leave New York harbor in a fog, without the aid of an ordinary pilot.

Mr. Hanson is one of the most remarkable men in radio. He was born in California, twenty-nine years ago. When a little boy, he was experimenting in electricity. While he was a pupil in a Los

Angeles grammar school, he built a wireless telephone with which he talked over short distances. At St. Paul's Preparatory School, later, he continued his experiments. In 1911, when but nineteen years old, he invented a system of wireless transmission. This invention is the basis of important patents he now holds. During the World War, he gave the United States and its Allies the use of his inventions including his audio piloting system for the guiding of vessels through fogs and mine fields.

Probably a million dollars has been spent on the development of the miracle-working vacuum tube. Several hundred patents have been taken out to protect it in the various phases of its progress.

In the center of the vacuum tube is the filament—a fine tungsten wire. The spiral around it is called the grid. The little metal-cylinder is the plate. The grid amplifies the energy received from the electrons—those invisibly minute particles which many scientists consider the

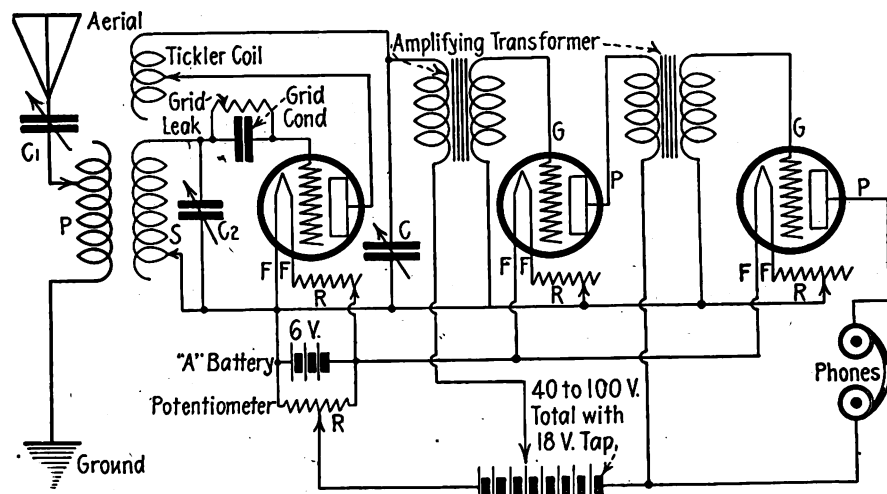
final unit into which all matter can be divided.

The grid controls the pressure of the electrical current. When powerful vibrations are employed, a great volume of sound is the result; but it is unintelligible because of the hissing and sputtering. The little grid in the tube controls the energy coming into it. The result is clarity as well as volume—a smooth reproduction of natural vibrations as those made by the voice in speaking.

Now, in amplifying, it is not necessary to work with one tube only. The current may be passed from one to another. Therefore the vibrations—the sounds being transmitted—become greater and greater in power.

It is estimated that one unit of electrical energy is increased ten times by means of the vacuum-tube amplifier. If one unit of electrical energy is increased ten times by means of the vacuum-tube amplifier—think what will happen after it has passed through six tubes and amplified a million times!

This Will Make Your Signals Louder



Detector and two-step amplifier showing necessary connections for the reception of weak signals. Drawn by F. Newman.

IT is a well-known fact that, for maximum amplification the characteristics of an intervalve tone-frequency amplifying-transformer must be such as to fit the output impedance of the preceding tube in a cascade

amplifying-set. There is an allowable variation of the constants of the transformer when loaded on the secondary by an amplifying tube; but, nevertheless, the maximum signal is obtained from a transformer de-

signed especially to fit the output impedance of the tube with which it is used.

In general, a tone-frequency amplifier-transformer should occupy the same position in the output circuit of a vacuum tube as the receiving telephone. The terminals P and F of transformer may be connected to the plate-circuit terminals which ordinarily are connected to the telephone receiver. The secondary terminals should connect to the grid and filament of the following tube of a multi-stage amplifier. A circuit using two stages of tone-frequency amplification is shown herewith. This circuit makes use of the detecting qualities of radio-ton UV-200. In all radio amplifier-circuits the insulation of all apparatus connected to the secondary must be as perfect as possible. Leakage from the grid to the filament of the amplifier tubes through the socket, mounting panel, wiring, or otherwise, will decrease the amplification—that is, lessen the volume and intensity of the supply. The diagram herewith was designed for use with intervalve tone-frequency amplifying-transformers.

Radio World's Hall of Fame



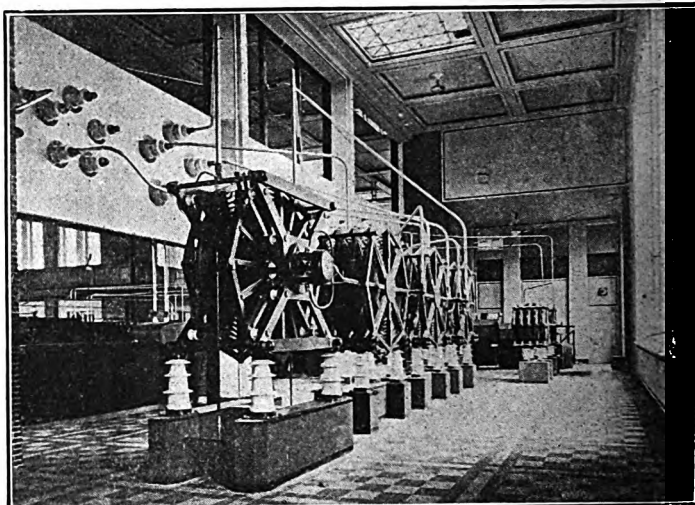
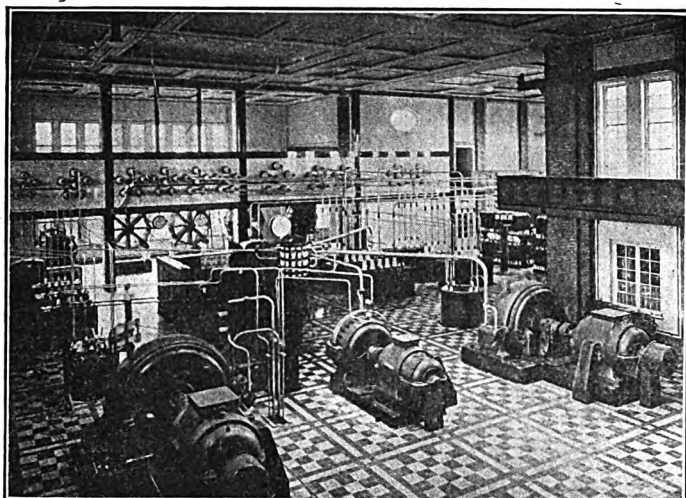
(c. Underwood & Underwood)

EARL C. HANSON

Inventor of the Vactuphone, an instrument for aiding the deaf; also the Audio Piloting System, which enables deep-sea vessels to enter and depart from New York harbor in a dense fog, without the aid of a regular pilot. Both inventions are operated by the vacuum tube, such as he holds in his hand.

Radio Progress in Foreign Lands

By Pierre LaSalle



(1) The well-placed equipment of the powerful trans-Atlantic station at Nauen, Germany. (2) The massive inductance coils which send out the powerful signals to all parts of the universe.

MUCH has been said about various American radio stations, but little credit has been awarded European listeners. If one remembers that some years back, a powerful radio-station was erected and opened at Sayville, Long Island, by the Atlantic Communication Company, which employed the well-known Telefunken system of transmission. This station was built in order to operate directly with the German station at Nauen, Germany. When completed, trans-Atlantic radio-communication service was established. These were

the first two stations to operate on a commercial business across the Atlantic. These messages were distinctly heard.

The accompanying illustrations show the buildings and interior of the station. Figure 3 shows great buildings which make up the powerful trans-Atlantic station at Nauen. The high tower with its antennas are seen in the background.

Figure 1 shows one section of the interior with its layout of machinery. The large inductances which set up the energy on various wave-

lengths to be sent to the various parts of the world are seen in Figure 2.

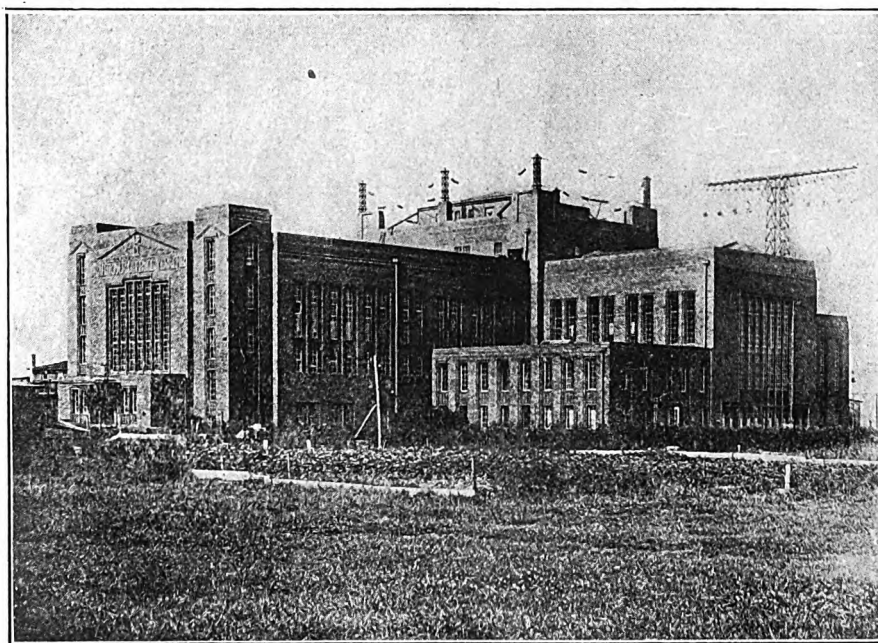
CZECHOSLOVAKIA is soon to have a central and subsidiary wireless system according to a report from C. S. Winans, U. S. Consul at Prague. The Ministry of Post and Telegraph of Czechoslovakia has followed all the latest developments in radio, sending engineers to foreign countries to study operating systems. When weather conditions are favorable, a large station will be built at Podebrady, Bohemia, where the natural features are said to be ideal.

The main station will be equipped with high-frequency generators (Le-tour-Bethenod type) producing 50 KW in the antenna. The entire station will be able to produce additional energy up to 100 KW at the antennas. If the work demands it, an additional 50 KW set will be installed. Two towers, 150 meters in height, will be erected. It is estimated that the radius will be about 4,000 kilometers.

Podebrady station will be the main sending-station for Prague, but a small station equipped with electron lamps will also be erected there by the State Post and Telegraph Office.

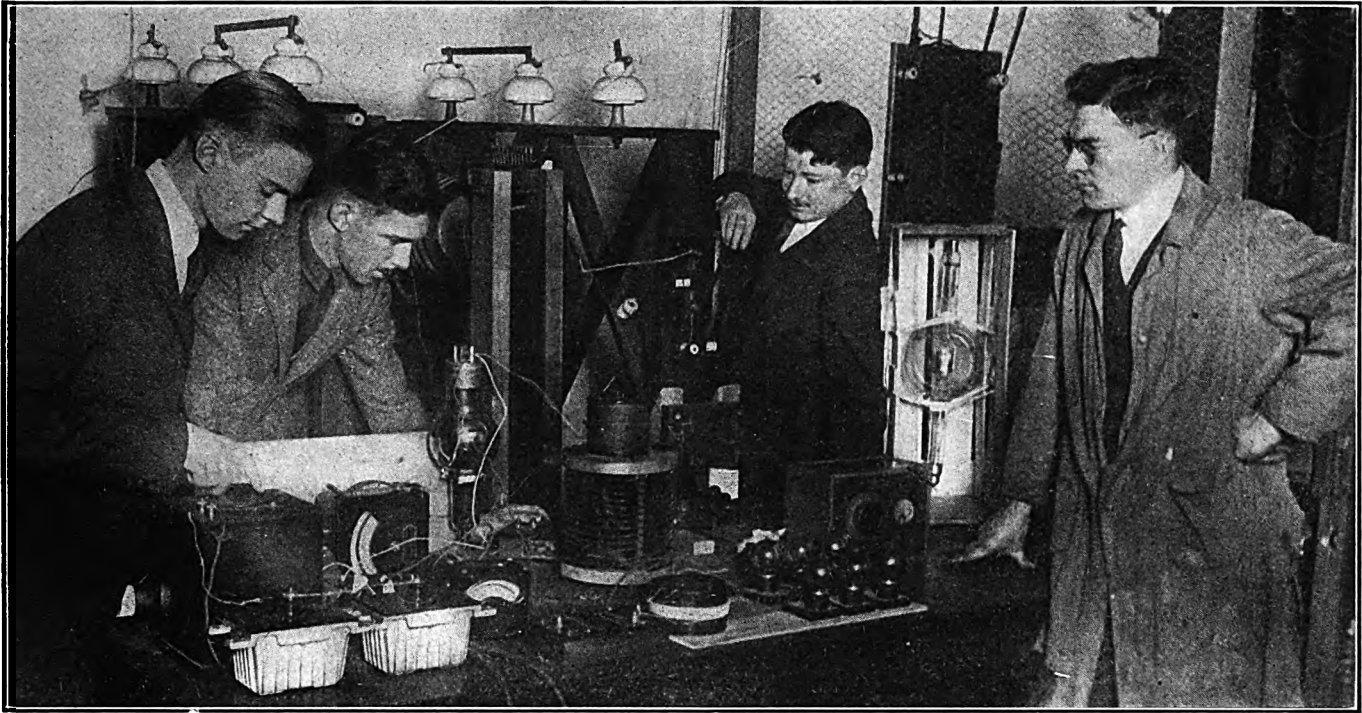
At Kral Vinohrady, a district of Prague, a radio station with a radius of 400 kilometers is now being operated. At Brunn, Moravia, a radio plant having a range of 1,000 to 1,500 meters has just been tested.

For communication between Slovakia and Prague, as well as the Orient, a new radio station is being



(3) Massive buildings of the powerful trans-Atlantic Station at Nauen, Germany. The company operating this plant claims that it is the first European station to transmit commercial traffic across the Atlantic ocean.

Cornell's Equipment for Instruction



(C. Kadel & Herbert News Service, N. Y.)

You will be as much interested in this photograph as are the students who posed in the course of their work. It shows a section of the laboratory at Cornell University where instruction is given in the underlying principles of radio. Not only are men made familiar with the high theoretical phases of the art, but they are sent to the test and experimental rooms where most of the practical knowledge of connecting-up instruments is unveiled. Professor B. K. Northrop, of Cornell, is here photographed with his students. An experiment in the operation and maintenance of vacuum tubes is being made.

(Continued from preceding page)

erected at Kosice, Slovakia, and another, at Bratislava, will be operated for the benefit of the Danube shipping and the International Danube Comm. now sitting there.

A radio sending and receiving station has been projected for Liberec (Reichenberg). It is expected that it will be completed by August 20. The State Telegraph Office at Karlovy Vary (Carlsbad) also contemplates the erection of a small station there before the season at the baths opens.

Because of the importance of radio communication to aerial navigation, the Czechoslovak Ministry of Post and Telegraph and the Ministry of National Defense are now building a station with a range of 1,000 kilometers at Kbely near Prague, the starting point of air planes for Paris and Warsaw. In Western Bohemia, at Pilzen or Cheb a station for operation in connection with the air service for Paris will also be established, and another in Northeastern Bohemia for use in connection with the aerial route to Warsaw. The Prague, Brunn, Bratislava, and Kosice, radio stations will also serve air fleets, it is said. The Ministry of National Defense is now building a system for defense.

In view of these advances in radio development, bankers and industrial concerns in Czechoslovakia expect, within a short time, to be receiving information by wireless from the bourses of London, Paris, Berlin, Zurich, Amsterdam and New York.

FRANCE has established wireless telegraph posts at Rouen. Pilot boats on the River Seine will be used to transmit messages relating to maritime affairs and the promotion of port services, according to the Department of Commerce. The pilot boats, it is reported by United States Consul M. B. Kirk, of Rouen, will transmit by wireless the arrival of all vessels coming up the Seine on every tide and will instruct the pilot vessels where to place ships on their arrival.

Three pilot boats, have been equipped with radio, using continuous waves averaging 520 meters. Ground stations employ 720 meters with an intermittent spark, except at night when as in commercial work 600 meter waves are used. When merchant vessels are not equipped with radio urgent messages are transmitted for them to their brokers through the Post Office for 40 centimes per word.

"Civilization Is Communication," Says Admiral Moffet

USING a modern version of Kipling's "Civilization is Transportation" as his inspiration, Rear-Admiral William Moffett, Chief of Naval Aviation, said recently while broadcasting over the Naval radiophone: "Civilization is Communication. By this new wonder, the radio telephone, unnumbered millions of the uneducated, as well as the educated, can now be directly reached; we can disseminate information and knowledge as never dreamed of before. We are on the threshold of a new era, and are beckoned on by two wonderful hands—radio and aviation. May we all do our best by them, not only for science's sake but for our country's. Radio and aviation go hand in hand in the annihilation of space."

Recalling the legend of Jason's ship, "Argo," with its prow of talking oak which, in time of need, advised the argonauts of their proper course, Admiral Moffett said that, today, the airplane equipped with radio was more wonderful than this mythological ship for the airplane is not only guided by a voice but can communicate continually with its base on land or sea.

Valuable Pointers on Aerial Construction

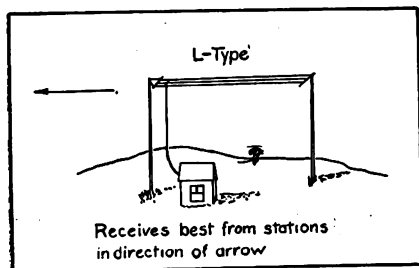
By Edward Linwood

WITH the newspapers carrying many yarns about the use of the loop aerial as a direction finder this question is asked by many amateurs, "Will my aerial receive better in one direction than in another?" Perhaps he wonders if his aerial is slung in the correct direction to receive his favorite broadcasting station. There is an answer to his question which every man can work out for himself.

Loop aerials are not the only types that show a preference of direction. As a matter of fact, every aerial except the simple vertical-aerial has directional characteristics.

If a single wire is erected vertically into the air and if it were possible to support such a wire without guys of any sort, this antenna would receive signals from all directions equally well. But since guy wires are essential, this perfect condition of reception is not attainable except under unusual circumstances.

The aerial most in favor with amateurs is the type known as the "inverted L." This consists of a wire strung horizontally between two supports of approximately equal height with a lead-in wire connected to one extreme end and carried to the tuning coil. Now, if the average person

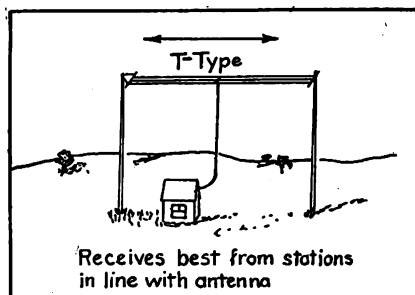


Drawn by E. L. Bragdon.

were to be asked his opinion of the most efficient direction in which this aerial should be pointed, the answer, in nine cases out of ten, would be: "It would be pointed in the direction of the open end."

This is incorrect. The inverted L antenna will give the strongest signals in the direction *away from* the open end.

This statement should not be taken to mean that an inverted L aerial is wrongly erected if it fails to point toward at least one of the broadcasting stations. Taking into consideration the fact that the amateur likes to hear the greatest number of stations from



Drawn by E. L. Bragdon.

everywhere the L type will fill his needs best, for while it is best for one direction its ability as a receiver of signals from other directions is nearly as good. Assuming that it receives best in the direction away from its open end, and calling that performance 100 per cent., it is probable that its performance in the exact opposite direction would be 75 per cent., a difference that is certainly not worth worrying about.

Following the inverted L, antenna comes the type known as the T antenna. This type consists of a flat top made up of one or more wires strung horizontally or nearly so to the ground level and a lead-in wire connected to the exact mid-point of the flat top. This aerial has two open ends. Suppose, for example, that the aerial points north and south. If signals are coming from the north, the south end of the antenna will do most of the "picking up" of impulses.

If the signals come from the south, then the north half of the T aerial will do most of the reception. Thus the T aerial is equally good for both directions in which it points. But for other directions, such as east and west in the imaginative aerial above, its ability is lacking.

At this point, having understood the characteristics of the chief forms of antenna, it is a simple matter to see that the ideal aerial system for a receiving station would be a series of T aerial laid out like the spokes in a wheel interconnected with switches in such a way that any one of the separate T aeriels could be connected to the receiving set, the choice depending on the direction from which it is desired to receive signals. But an antenna system as elaborate as this would be expensive to build and more expensive in up-keep. It is doubtful if the stunt would be worth the trouble it would demand when completed for operation.

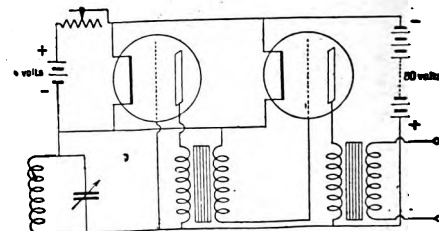
From a French Amateur

WITH the entire world grasping the radiophone, it seems that amateurs in foreign lands are anxious to get hold of some American ideas, while, on the other hand, we are seeking to grasp theirs for comparison.

So, for the American, RADIO WORLD herewith shows two circuits which some of our readers may like to try out. They are French in idea and design.

No. 1 shows a radio-frequency circuit using amplifying transformers for amplification. This circuit seems to look good; but RADIO WORLD would like to hear from any amateur who may attempt this circuit. The aerial and primary circuit are not shown; but the circuit shows everything concerned from the secondary up to the final secondary of the amplifying transformer which was intended for the detector circuit.

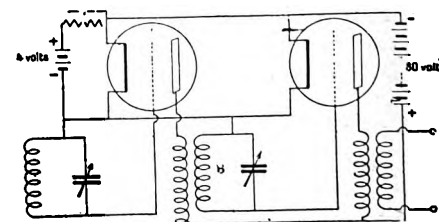
If one wishes to use this circuit he



Two steps of radio frequency to be coupled to detector circuit, using amplifying transformers.

should be careful of the last transformer secondary used, so as not to get confused.

No. 2 shows another circuit in which resistance coupling is used as a means of transformation of power. As these circuits are only in their infancy, wonderful results cannot be expected as these circuits are only for experimentation.



Two steps of radio frequency using resistance coupling replacing the amplifying transformers.

Radiotelephony has made possible the voice contact with an audience of thousands and tens of thousands without the necessity of assembling humanity under one roof. It is pre-eminently a home acquisition, bringing news, music and other attractions.

What Is Meant by "Tuning"

By E. L. Bragdon

NO man, in any art, makes quicker progress than the raw amateur who buys a set on Monday morning, tunes in on any (broadcasting) station, Monday evening, and qualifies as a capable radio-trician before Sunday dawns. "Microhenries" sound more to him like a trick *non de plume*; but he uses the term whenever he can slide it into the conversation without perceptible jar.

He is the man who will read a Bureau of Standards report from cover to cover without flinching, even though all he knows when he finishes is that the monograph is about radio.

But there are hundreds—yes, thousands—of beginners who prefer to take the early steps with greater caution. They refuse to talk in radio terms unless they know whereof they speak. If they don't know, they ask questions; and if they don't understand the answer, they'll ask someone else to explain. Their start, to be sure, is not as flashy as that of the other amateurs, but they surely get there in the final roll call. It is to these men, particularly, that this article on the "whys" and "wherefores" of *tuning* is dedicated.

If you have read many treatises on the fundamentals of radio you must have been struck by the ease with which the writer passes over the act of tuning with a simple twist of a phrase. It usually goes like this:

"After connecting the lead-in wire to the aerial binding post, and the ground wire to the post marked 'ground,' adjust the tuner until signals are heard."

Because tuning is so simple and because it comes as second nature to an experienced man, it is assumed that the novice will grasp it as quickly. The amateur can follow directions—and does; but he appreciates knowing "why." He is a querist.

In tuning a radio circuit, there are two factors to be considered; in fact, *tuning* means the adjusting of these two factors. They are *Inductance* and *Capacity*.

Induction is produced when a current is sent through one wire, or coil of wire, which rests in the vicinity of another wire or coil of wire. The wire containing the current flow is circled by rings of magnetism.

The effect is the same as if a myriad of smoke rings were made to pass around and around a rod. These rings

of magnetism, called magnetic flux, are present in greatest number if the current flow is changed in any way—that is, decreased, made zero or made a maximum. If the second coil is brought near the rings, a separate current will be set up in it although there are no metal connections between them.

The current in the second coil is called the *induced current*, and the act of producing it is called *Induction*.

Capacity is difficult to define in simple words. It is one of the most elusive of electrical properties.

Perhaps if it is pictured as an electric strain, its understanding will be reached more quickly.

Up to this time, practically all electric terms have had some reference to a conducting metal. Capacity really deals with insulating materials. In fact, an insulator is the basis of all capacity.

If a piece of glass is coated on both sides with a sheet of tinfoil, silver, copper, or any other metal and a terminal of a battery or generator connected to each side the glass will take up a certain portion of the electricity and will continue to collect it until it will stand no more. At that point, it will disgorge the electric charge. That it is the glass and *not* the tinfoil or other metal that collects and holds the charge, may be verified by removing the metal sheets and testing the

glass. It will be found that the charge is in, or on, the glass.

Physicists believe that the molecules of the glass are separated by the electricity, the positive going to one side and the negative to another. This sets up strains in the glass which remain until both sides are connected by a wire. This act restores the molecules to their original and normal position, and the rearrangement causes the discharge of the electrical energy.

Capacity is the electrical property produced when a glass plate is thus charged.

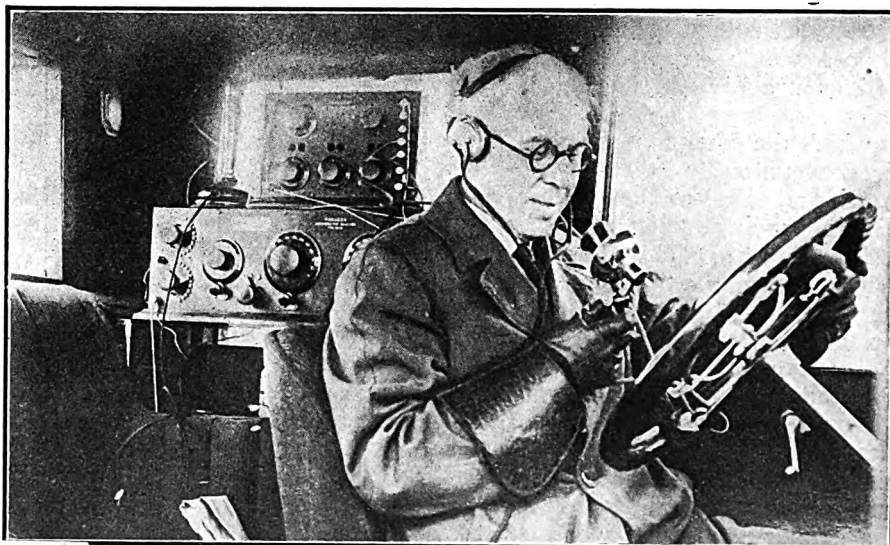
A radio circuit, as has been said, previously, consists of a combination of Inductance (coil of wire) and Capacity (insulator faced by conductors) in varying proportions. The exact proportion of the Inductance and Capacity determines the wave length.

Assuming as an example that the Inductance is equal to 100 and the Capacity to 10, producing thereby a wave length of 100 meters, then if the inductance is reduced to 75, the wave length will be changed unless, at the same time, the capacity is increased to $12\frac{1}{2}$.

These figures are used only as a basis for the example.

Now, tuning consists in maintaining this balance between capacity and inductance, or in adjusting the two factors to obtain the wavelength.

Doctor's Motor Car with Radio Set



(c. International)

Dr. David Cottrell is said to be the first Chicago physician to have his motor-car equipped with a radio set, so he may receive messages after visiting a patient.

Radio, Once a Fad, Becomes a Business

By *Carl H. Butnam*

RADIO which started as a scientific experiment only, recently became a craze; but now, certainly, it is rapidly approaching the status of a business, or, perhaps, a profession.

Even the experts do not dare estimate the number of receiving stations, although 600,000 has been hazarded as a fair guess. Most of them say that the output of the manufacturer only, is the limit to which, receiving stations will go. It is known, however, that there are 18,690 sending stations in operation to-day. This surprising figure was reached on April 15, and includes commercial, ship, and amateur stations licensed by the Department of Commerce. Of the total, 15,907 are land stations, of which 678 are commercial, the balance being amateurs and special amateurs.

There are ten trans-oceanic companies operating in this country. There are 120 other stations licensed to operate from city to city, while 30 "PG" stations are licensed to communicate from the coast to ships.

The number of limited commercial-stations, commonly called broadcasting stations, which send out radio telephonic entertainment, market and weather reports, reached 182, on April 15; but other applications are on file, and the daily mail brings dozens of them. There were only 67 such stations on March 10, showing an increase of nearly 3-1/3 a day. Thirty-two were issued during the past week. Special stations total 534, comprising 213 experimental, 123 technical, mostly colleges, and 198 special amateur stations. There are to-day 15,031 regularly licensed amateurs transmitting, and of course receiving also, all of whom are licensed through their district inspectors in the 9 districts into which the country is divided for their convenience.

American ships, to the number of 2783, are carrying radio and are listed as ship stations. This number is nearly four times the total ships which were licensed before the World War, and indicates the growth of radio on the high seas.

The radiotelephone is rapidly coming into ordinary business life:

Among the 32 new broadcasting stations licensed recently, Los Angeles secured eight, including one license for a laundry and dye works. St. Louis opened three stations, one of which is operated by the local Chamber of Commerce. Six newspapers

took out broadcasting licenses bringing the total number daily papers sending news and entertainment to 23.

There are many radio corporations, electrical manufacturing equipment companies sending entertainment; but there are also hardware and department stores, oil, stone, and motor dealers, as well as chambers of commerce, municipalities, churches, and colleges.

The following licenses were issued during the past weeks, April 7-22:

WMB—Auburn Electrical Co., Auburn, Me.

WEB—Benwood Company, Inc., St. Louis, Mo.

WDZ—James L. Bush, Tulscola, Ill.

WPE—Central Radio Co., Inc., Kansas City, Mo.

WCK—Stix-Baer, Fuller St., St. Louis, Mo.

KNR—Beacon Light Co., Los Angeles, Cal.

KXS—Braun Corporation, Los Angeles, Cal.

WAAH—Commonwealth Electric Co., Inc., St. Paul, Minn.

KZI—Irving S. Cooper, Los Angeles, Calif.

WAAJ—Eastern Radio Institute, Boston, Mass.

KON—Holwasser, Inc., Los Angeles.

WAAL—Minnesota Tribune Co., Minneapolis, Minn.

WAAG—Mullins Electric Co., Tacoma, Wash.

WAAM—I. R. Nelson Co., Newark, New Jersey.

KSS—Prest and Dean Radio Research Lab., Long Beach, Cal.

WAAO—Radio Service Co., Charleston, W. Va.

KNV—Radio Supply Company of California, Los Angeles, Cal.

KJC—Standard Radio Co., Los Angeles, Cal.

WSB—Atlanta Journal Co., Atlanta, Ga.

KQP—Blue Diamond Electric Co., Hood River, Ore.

KUS—City Dye Works & Laundry Co., Los Angeles, Cal.

WAAG—Elliot Electric Co., Shreveport, La.

WAAK—Gimbel Bros., Department Store, Milwaukee, Wis.

WAAR—Groves-Thornton Hardware Co., Huntington, W. Va.

KXD—Herald Publishing Co., Modesto, Cal.

WAAZ—Hollister Miller Motor Co., Emporia, Kansas.

KWH—Los Angeles "Examiner," Los Angeles, Cal.

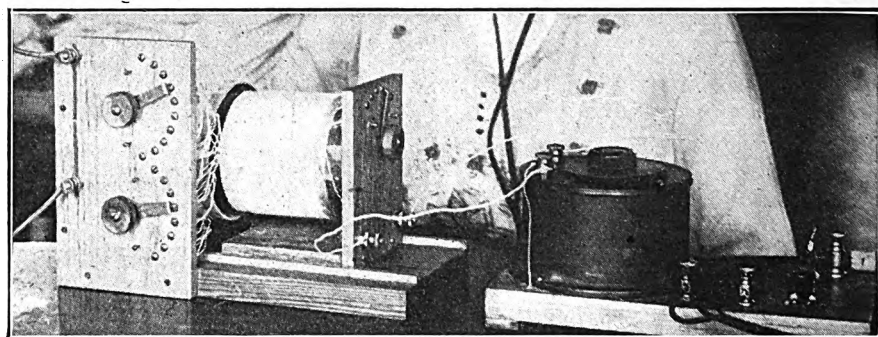
KOQ—"Modesto Evening News," Modesto, Cal.

WAAQ—New England Motor Sales Co., Greenwich, Conn.

WAAE—St. Louis Chamber of Commerce, St. Louis, Mo.

KOE—"Spokane Chronicle," Spokane, Wash.

Inexpensive Radio Set Made By Woman



(C. Underwood & Underwood.)

This radio outfit was built by the Bureau of Standards, Washington, D. C., and the total expenditure was \$13. It is operated by Mrs. W. F. Harlow of the Radio Division.

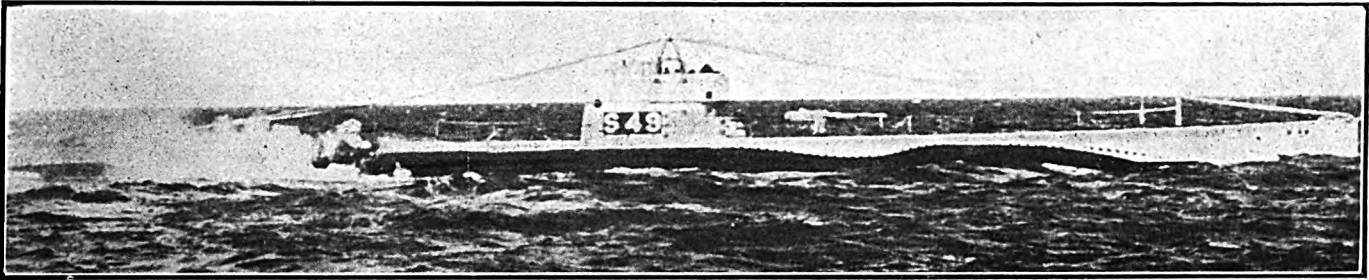
MOST every amateur, to-day, is building, or contemplating building a loose coupler so he may be able to pick up the various broadcasting stations now sending out concerts. The accompanying illustration shows a home-made loose coupler, made by a woman and tested out successfully. The primary winding has sufficient taps to cover the wave lengths of the broadcasting stations, while, with the aid of the secondary winding, variable condenser and detector circuit, the builder was able to hear various con-

certs. The coupler was made up at a very low cost giving her the experience of manufacturing one of her own receivers.

Grocer Advertises By Radio

In Des Moines, Iowa, there is a grocer who talks to his customers by radiophone, giving them prices on staple goods and advertising his special sales. Many customers within a good radius listen to his reports, spread the news to their neighbors.

Naval Radio in War and Peace



(c. Kael & Herbert News Service)

Radio played such an important part that in wartime Uncle Sam has improved his equipment to a degree whereby a submarine may work like a battleship. In former years, the radio antenna was carried on masts that had to be taken down before the boat could submerge. Now the latest and most modern submarine, S-49, carries the antenna with the "sub," and the entire craft submerges in 45 seconds. This is a great advantage to the submarine, saving time for a quick getaway in case of disaster.

NAVAL Radio Compass Stations serve a multitude of purposes both in peace times and during war. It has been unofficially reported to the Navy Department, that, during the past winter, fourteen large merchant-vessels were saved from destruction by the Navy's Radio Compass Stations. Due to the severe storms on the Atlantic, ships were often unable to determine accurately their positions on approaching the coast. By simply calling by radio the nearest fixed-compass station, and asking for bearings, they were given their positions accurately. It is estimated that fourteen ships thus aided would otherwise have been wrecked.

The Navy maintains along the coasts of the United States, well-equipped compass stations, the total cost of which is not more than

\$1,000,000. It is estimated that, during times of peace, the value of ships saved from destruction during three months of bad weather, will more than offset the total cost of installation and maintenance of all the radio compass stations of the Navy.

If an enemy ship, 500 miles off the coast, sends a radio message, the coast compass-stations immediately determine the direction of this message. This direction in degrees is sent to a central office where the exact position of the enemy may be located.

During the World War, the British located many enemy submarines by this method. During the night, German submarine-commanders were very loquacious, and talked by radio with other submarines and with their home bases. The British compass stations, located on the coasts of

England, Scotland, and Ireland, obtained radio compass bearings of these submarine radio-messages, plotted the bearings, and determined the position of the submarine. Proper orders were issued to all allied ships in order that they could avoid the areas where the radio showed submarines to be. Every time a ship left an Allied port, the commanding officer was given the latest submarine information obtained by the use of the radio compass. A great many ships were saved by these compass stations, not only from submarine attack but also from grounding.

The radio compass is also used by aircraft flying up and down the coasts. In bad weather, the aircraft frequently finds its base by asking the radio-compass station for a bearing. Receiving the bearing of the station, the pilot flies directly toward it.

Combined Radio for Talking

AN interesting experiment in the transmission of the voice from ship to shore and vice-versa through the double medium of the radiophone and the wire telephone took place recently when passengers aboard the United States liner "America" spoke to a group in the rooms of the American Telephone and Telegraph Company at 24 Walker St., via the Western Electric wireless experimental station at Deal Beach. Save for occasional defects in articulation, due to interference and atmospheric conditions, the experiment was successful.

Continuous attempts have been made since the development of the radiotelephone to make practicable uninterrupted conversation over both wire and wireless. On the Pacific Coast, a test was made when the voice was carried continuously from the California mainland to the Catalina Islands via wireless and wire—one subscriber of a telephone company

speaking to another without either of them journeying to a radio transmitting station. It is in this direction that informed observers look for the highest practical usefulness of the new mode of communication.

Receiving Without Batteries

THE public will be enlightened regarding a new method of receiving with ordinary electron tubes for amplifying, but without a battery, which has been developed by the experts of the Bureau of Standards. Briefly the scheme is to utilize a 60 cycle lighting current for both filaments and plates of the electron tubes. The amplifier recommended in the report has three radio-frequency stages, and two audio-frequency stages, and requires a crystal detector. A 60-cycle current when used in an ordinary amplifier carries a strong hum, or ripple, offering serious interference with messages, but this is eliminated by

balancing resistances, grid condensers, and special grid leaks of comparatively low resistance, a telephone transformer in the output circuit and a crystal detector instead of an electron tube. It is said that the amplification was as good with alternating current as with direct. The complete set is light and compact for use.

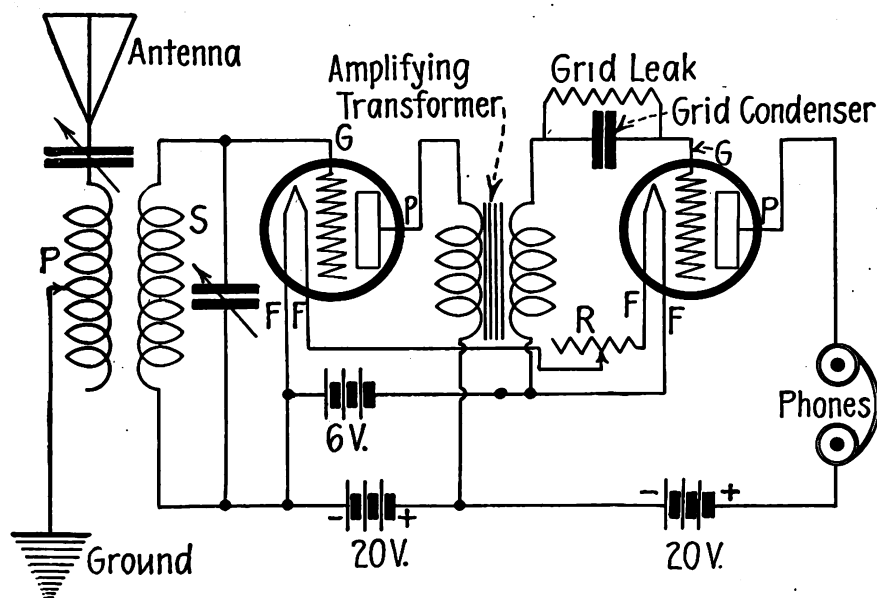
Naval Pacific

Service Extended

President Harding has signed the bill extending the use of Naval Radio service across the Pacific for commercial and press purposes until June 30, 1925. This extension, however, does not apply to messages designated for China, as that service terminates on January 1, 1924, on account of international wireless agreements. The signing of this bill relieves many business concerns and news services, especially on the Pacific Coast, as the present commercial facilities are said to be inadequate and expensive, due to the congestion of other despatches.

Radio-Frequency Amplification and Regeneration

By Frank Armstrong



Radio-frequency circuit showing one tube as a radio-frequency amplifier and a detector tube for rectification and amplification. Drawn by S. Newman.

MANY requests have been received by RADIO WORLD seeking information on two important subjects: regeneration and radio-frequency amplifiers. These two subjects are headliners in radio. One of them (regeneration) being in practical use to-day; the other (radio-frequency amplifiers) is still in a stage of experimentation. Referring to regeneration, the accompanying diagram explains in itself this remarkable circuit. One realizes that a tube must be used

secondary circuit so it may perform its duty. There are a number of regeneration circuits, but the diagram herewith published is one of the many by which results can be expected.

In taking up radio-frequency amplification, we show one stage of radio frequency where the weak signals are amplified and then sent through the detector circuit for rectification and amplification. Two tubes are shown, but the amateur should remember that many hundreds of amateurs are experimenting with this idea and some excellent results have been secured. However, as stated, it is only in experimentation, and we feel, that in the near future, radio frequency will be playing an important part.

Ziegfeld Objects to Radio

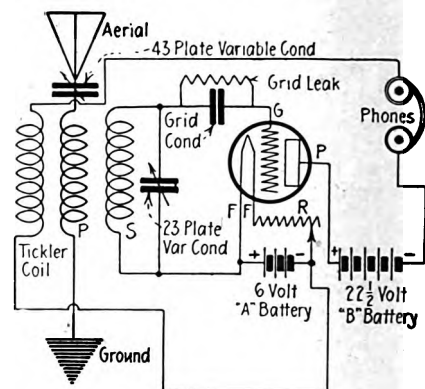
Actors and actresses under contract to F. Ziegfeld, Jr., the theatrical producer, in future will have to decide between their desire to talk over the radiophone and working for him. He has announced that his performers must not under any circumstances raise their voices for those who are listening in at their radio sets. He contends that radio performances cheapen the reputations of the artists and detract from the box-office attendance.

What a novelty it is to be entertained without having had to pay war tax!

A Circuit for Amateurs to Experiment with

A NUMBER of amateurs have written to RADIO WORLD in regard to regeneration and the various circuits pertaining to this term.

It is evident that many amateurs have tried out various circuits, but feel that there are still more to be experimented with. To keep the ama-



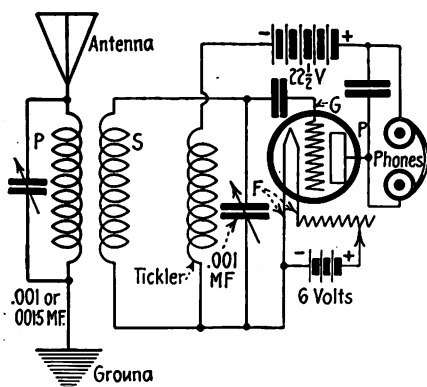
Circuit employing tickler coil set to produce regeneration. Drawn by S. Newman.

teur on the table we show, in the accompanying diagram, a regenerative circuit employing a tickler coil in the plate circuit. This circuit RADIO WORLD would like to have tried out. Do so and make your report to us. Let us know what results you obtained.

The diagram being self-explanatory should be another circuit for the experimenter.

Must Be Tuned to C. W.

C. W., being constant in amplitude, does not dampen out and is, therefore, known as an undamped wave. The discontinuous wave, on the other hand, not being constant in amplitude, dampens out quickly and is, therefore, known as the damped wave. The first is a much better medium for bridging great distance at small cost, and, therefore, is slowly supplanting the older method. Then, too, it has decidedly selective qualities not readily attributed to the spark system. In other words, a radiated C. W., when intercepted by the receiving station, is so sharp and constant in character that the receiver must be tuned exactly to its wave length, otherwise it will not affect the instrument. When we consider that there are to date 13,835 amateur transmitting stations in the United States, and nearly 300,000 receiving units, this sharpness of tuning is a most important factor in eliminating interference between stations; indeed, in time to come it must supersede entirely other less selective methods of transmission.

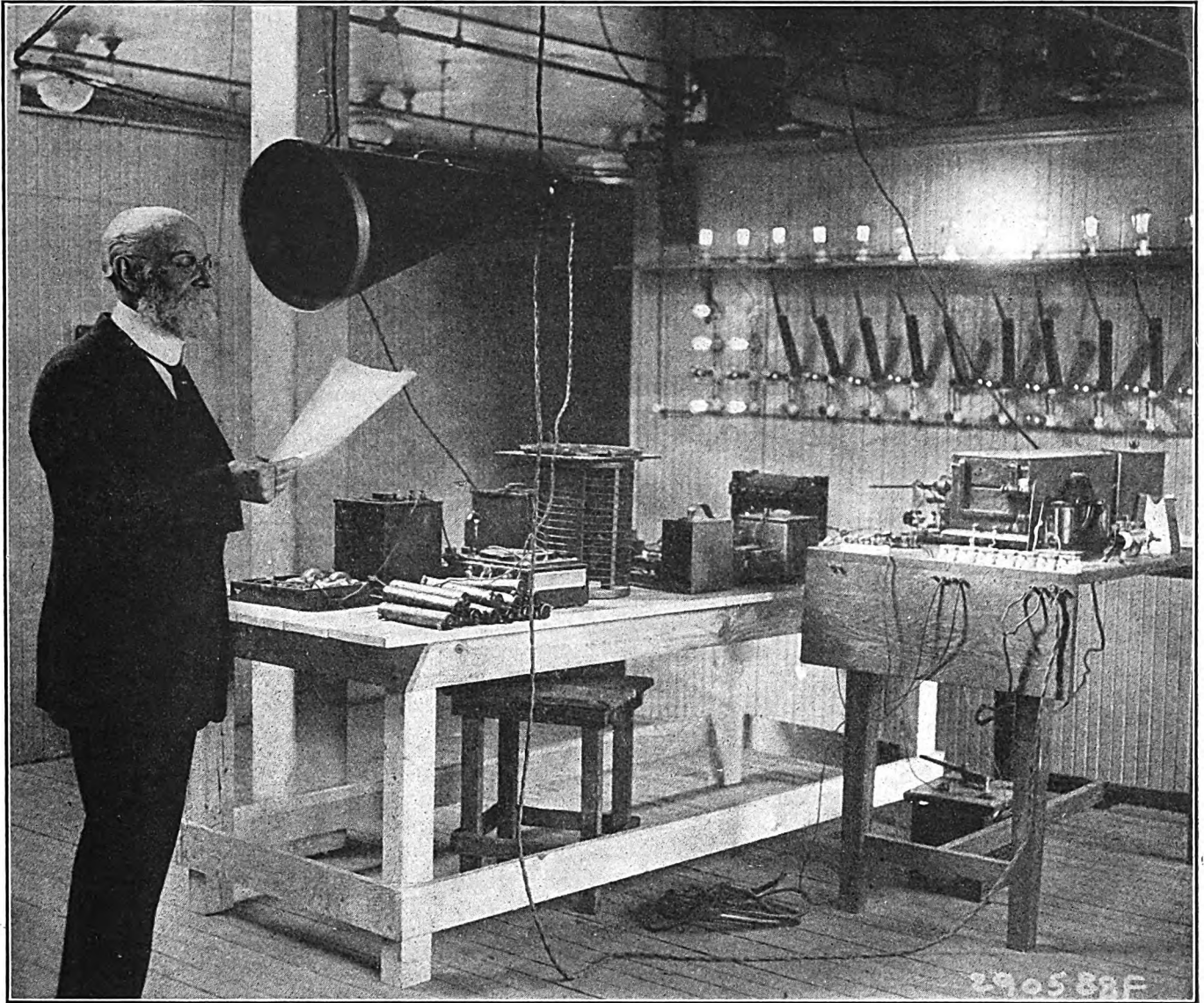


Regenerative diagram employing a tickler coil in the plate circuit. Drawn by S. Newman.

as a step towards this term, but the main fact must be realized that we must have some means of feeding back the signal for regeneration.

This is better known as a tickler coil. It is connected in series with the plate circuit and fed back to the

Delivering a Lecture at Tufts' by Radio



(c. Underwood & Underwood.)

Professor Charles Ernest Fay, dean of Tufts College, Boston, Mass., delivering a radio lecture to scores of listeners. Dr. Fay officially opened Tufts College radio educational department and was photographed reading his address into a large horn-shaped microphone in the American radio and research laboratories at Medford Hillside, Mass. Tufts College was the first institution of learning in the United States to introduce a course in radio.

Do Not Overlook the Amateur

By Burt B. Barsook

THERE has been considerable talk regarding the amateur—what he has done and what he is doing has probably received far less attention than he has really deserved.

If we go back into the history of all successful inventions and appliances, we will not fail to find that the amateur was at the bottom of every conceivable mechanical device that has proven its merits in practical usage.

The amateur in the radio line is, by no means, to be overlooked at a time when, perhaps, more real practical ideas will be developed than at any

other time in the history of wireless telegraphy or telephony. If you are interested in radio, get all the ideas you can. In the *RADIO WORLD* you will find some very valuable information, and you will find a lot more by talking to the young man or woman who has done experimenting with either the bulb or crystal sets.

This is aimed chiefly at the wise-ones who do not believe in talking to an amateur who can really impart some very valuable information to them. There are men of wide experience in the radio world who have knowledge

far surpassing the amateur it is true; but do not overlook the amateur if you are desirous of obtaining information that may be of material value to you. There are amateurs—many of them—who can run rings around technically trained men in the radio field.

Shipping by Radio

A. D. Lasker, chairman of the Shipping Board, has joined the radio fans and purchased a receiving set, which he has installed in his home on 18th Street, in Washington, D. C. Recently, he talked from his office to the captain of a shipping-board vessel 100 miles off New York.

The Radio Primer

A. B. C. of Radio for the Beginner Who Must Have the Facts
Put Plainly and Tersely, and all Terms Fully Explained

Radio Terms at a Glance

PRIMARY. The name used to designate the outer coil of a loose coupler, variocoupler or transformer. The primary is more correctly given to the winding into which an electric current is sent, whether it be the inner or the outer coil, but in radio receiving sets it is practically always the outside coil.

SECONDARY. The name used to designate the inner coil of a loose coupler, variometer, or transformer. It is, more correctly, that coil from which the current is taken after it has been sent through the primary. So far as electric operation is concerned, the primary or secondary could be either the inner or the outer coil.

CAPACITY. One of the properties or states of electricity. Capacity is produced when two conductors insulated from each other are connected to the sides of an electric circuit. The electricity does not jump from one conductor to the other, through the insulator, but it does strain the latter. When the insulator has been strained to its limit, it automatically dumps its charge. Capacity is one of the essen-

tials of a radio circuit the other being inductance, previously defined.

DISTRIBUTED CAPACITY. If a receiving set is to produce the finest clearest results with the least interference from other stations, it is absolutely essential that the inductance and capacity be under close control. A variable condenser supplies capacity in controllable quantities, and if the inductance were pure inductance the wave length of the set would be a certain definite figure. But with most tuning coils there is some capacity between the individual turns of wire. Thus, instead of having one circuit containing an inductance coil and a condenser, which is the ideal condition, the amateur is confronted with one principle circuit of this nature and numerous miniature circuits composed of the inductance between turns of the tuning coil and capacity between the same turns. In non-technical terms, this condition has the effect of giving the set more than one wave length. It broadens the wave and makes close tuning practically impossible.

Thus we have the peculiar state of the layers in reverse order, as: 1, 3, 2, 5, 4, and so on.

Not all coils of this type carry the name of "honeycomb." This was originally a trade name given to the coils by one of its inventors. Since then other coils, very similar in general scheme, but embodying slight rearrangements in wiring method and procedure, have made their appearance. The names given them are "banked coils," "lateral," or "duo-lateral."

To show how compact these coils are, a coil which can be used to tune in a transmitting station sending on 14,000 meters will be only slightly over an inch in thickness and about four inches in diameter.

* * *

What is the variable condenser?

A variable condenser consists of a number of semi-circular metal plates arranged in two sets. One set is stationary; the other can be moved on a pivot so that they enter between the stationary plates but without touching them. All the stationary plates are connected and, likewise, the rotating plates. The plates may be of aluminum, brass, or any other metal that retains its shape.

* * *

What does the variable condenser do?

The variable condenser supplies an electrical quantity called *capacity*. Radio circuits are made up of Inductance and Capacity. Tuning coils supply much of the inductance while condensers are depended upon to supply the capacity. Perhaps a clearer idea of capacity would be gathered if a condenser were to be considered as a miniature storage-battery which catches and holds the minute electrical impulses until there are sufficient to make an impression on the head phones.

* * *

How does a variable condenser store the impulses?

Strange as it may seem, it is not the metal plates in a condenser that hold the impulses but, rather, the air between the plates. When the impulses come in from the aerial and are transferred to the detector circuit by simple tuner, loose coupler, variometer, or variocoupler, the

Honeycomb Coils and Condensers

By Edward Linwood

What is a honeycomb coil?

IN the descriptions of the other types of tuning coils, it has been evident that to obtain the required amounts of wire for long wave lengths would have necessitated large or long coils of bulky construction. Although the first thought would be to wind the coils in more than one layer, radio engineers know that when this is done the final result is never what it should be, due to a quantity known as "distributed capacity." This term means that each wire, with its neighbor, forms a miniature condenser; and while these condensers are all right in their place, they do not belong in a tuning coil, particularly when they are spread "all over the lot." If the capacity were con-

centrated, the objection would no longer hold; but this is not so.

It was while endeavoring to wind tuning coils in more than one layer, that the manufacturers found that if wires which should be neighbors were arranged so that they were only distant acquaintances the windings could be piled one upon another in a condensed space. Thus the honeycomb coil was born.

This coil derives its name from the peculiar appearance of the finished coil. In winding these tuning inductances none of the wires are ever parallel. They cross each other always at an angle. In some of the coils those wires, which should be in the second layer—that is, next to the first layer—are lifted up while the third layer takes their place.

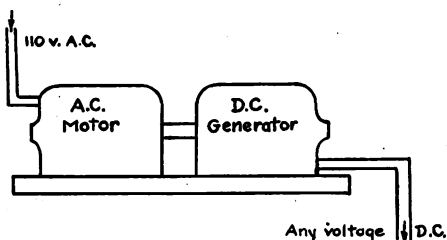
The Radio Primer (Continued)

Charging the Storage Battery

By E. L. Bragdon

IN many parts of the country, house-lighting circuits are fed from electric generators of direct current instead of from an alternating current.

Radio amateurs thus situated are already supplied with the kind of current required to charge storage batteries. For, as was emphasized in preceding installments, storage batteries are storehouses for direct current only. If alternating current is the only kind at hand, then some type of current rectifier must be resorted to in order to change the electric flow from alternating to direct. If direct current is available, the amateur need



A. C. motor and D. C. generator for converting alternating current to direct current. This is one method used to charge storage batteries if proper resistances are used. Drawn by E. L. Bragdon.

only regulate the voltage and current and he has a first-rate charging layout.

It also happens frequently that the amateur uses in his workshop an electrical machine known as a motor generator. This machine is, as its name implies, a combination of motor and generator. The motor is connected to the alternating current-socket and when rotating, drives a direct-current generator which is placed on the same steel shaft with it. The current from the generator of a motor generator can be used for charging storage batteries in the same way exactly that a direct current house-lighting circuit would be used.

The connections are shown in diagrams on this page.

To use direct current from either source ordinarily demands some device which will cut down the voltage from that which is generated to that which is suitable for the battery. Radio batteries are, for the most part, of 6 volts while the direct current supply lines are either 110, or 220 volts. Motor generator sets are more often designed to produce the same direct current voltage, namely, 110 or 220, but sometimes they are specially wound to supply a voltage that is suitable for storage batteries. In all cases where the voltage supplied is more than 6, some sort of *resistance* must be placed in series with the battery to eat up the excess voltage.

The excess is always dissipated as heat. Knowing this, it is evident that when batteries are charged from a 110 or 220 volt line the cost is considerably more than when a rectifier is used, since so many volts pressure must be done away with and wasted. Garages and battery charging firms get around this weak point by charging many batteries at a time. Thus, if the charging station was equipped with 110 volts direct-current it could hook up eighteen 6-volt batteries and charge them together. The pressure would then be divided equally between the batteries and there would be no need for the wasteful resistance.

Usually when it becomes necessary to reduce the voltage the resistance is inserted in the form of the rather old-fashioned carbon type incandescent lamp. Lamps are handy resistances, and inexpensive to replace. By inserting the proper sizes it is possible to charge the battery with current having the correct voltage. The following example will show how to figure the resistance needed for this purpose,

assuming that the supply line is 110 volts.

The radio battery is a 6 volt battery. The supply line is 110 volts. This means the difference between the two voltages or 104 volts must be

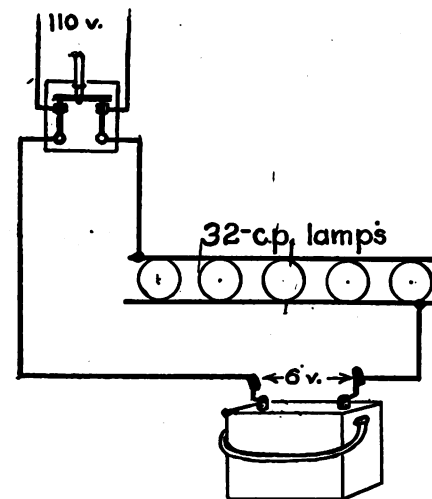


Diagram for charging storage batteries when 110 volts direct-current is available. Notice the lamps that are used for resistances for charging. Drawn by E. L. Bragdon.

dissipated in some way. Now, by an unalterable law of electricity, known as Ohm's Law, the resistance of a circuit is equal to the voltage divided by the current. The battery we are charging is a 90 ampere-hour battery and it is marked for a charging rate of 5 amperes. The problem then is to provide 5 amperes and 6 volts at the battery terminals. Using Ohm's Law:

Resistance (in ohms) equals voltage (6) to be wasted (104), divided by amperes (5), which gives: Resistance—21 ohms, approximate.

A 32-candle-power carbon incandescent-lamp has a resistance of 105 ohms. When connected to a 110-volt line, approximately, one ampere of current flows through the filament.

With these figures to work on, it is evident that if we connect five of the lamps to the 110-volts line, in such a way that one ampere flows through each individual lamp we will have five amperes passing through all together. But when the lamps are connected in the same way—this way being called "in parallel"—the resistance of all five lamps together will be one-fifth of the resistance of one lamp. Therefore the total resistance would be 105 divided by 5 = 21 ohms, which is the exact resistance required. By connecting the lamps as shown in the diagram the battery would be charged with the six volts pressure and at the rate of five amperes.

(Continued from preceding page)

sounds are made up of little trains of waves. These trains come in to the metal plates of the condenser, but they cannot jump across from one set of plates to the other. Thwarted at that, they are still able to strain or twist the air between the plates. This action is the same as is seen when a piece of soft rub-

ber is twisted in the hands. So long as the pressure is maintained, the twist will remain; but if one hand is removed, the rubber returns to its former shape and size. In the condenser, the waves strain the air and the air holds the strain until it has stood all that it can. Then it "back fires," to use a common term.



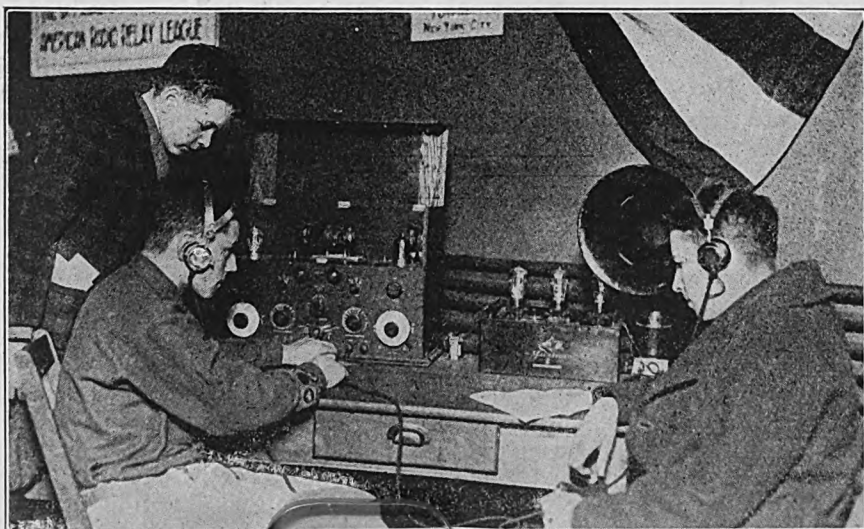
(c. International)

Radio class of Union College, Schenectady, N. Y. Outsiders may attend this class without charge.



(c. Underwood & Underwood)

Constance Talmadge, moving-picture actress, and her director, Sidney Franklin, using radio to direct a picture.



(c. Underwood & Underwood)

Boy Scouts are among the most active radioists. Here are (left to right) William Hodson, William McAllister, and F. Postkooke, considered experts by their brother scouts.

Radio as It Figures



(Right) Miss Elizabeth Bergner is the radio instructor at the Lane Technical High School, Chicago—one of the first public schools to make radio a part of its curriculum. Miss Bergner is one of the most advanced radioists among women, but her pupils are all very young men.

(c. International)



Radio Merchandising

Associated Advertising Clubs Uphold Radio World's Policy

YOU will doubtless be interested and pleased to know that the first two issues of your new publication have been discussed by the National Vigilance Committee and that we heartily commend your vigorous editorial stand in behalf of truth in radio advertising and merchandising. We assume that it will be your policy to keep out of your paper all advertisers who do not adhere to the common truth, or who advertise wares which are unworthy of confidence.

We shall be glad to co-operate with you to the limit of our ability along these lines. We invite you to ask us for information when needed and refer to us known or suspected cases with such facts as you have.

Heretofore we have worked in old fields. This is our first opportunity to work from the start in a new industry of importance.

We believe we can further the radio industry and the radio public a very great service by doing all in our power to keep the field clean from the start. Probably 100 per cent. efficiency is too much to hope for, but with your co-operation and that of others similarly-minded, we can hope to maintain a high standard.

Doubtless you know of our work; but, perhaps, a few lines on the subject will be of interest. We are not a commercial institution. On the contrary, we represent

225 advertising clubs and an individual membership of advertising men totaling some 25,000. Ten years ago, the advertising profession represented by our association adopted the truth emblem and organized the National Vigilance Committee to fight for it. Our work is known and endorsed, to-day, by leaders in every line of industry and by all divisions of advertising and Governmental agencies. Our salaried staff includes men experienced in this work, backed by extensive records and a nation-wide chain of local bureaus.

We know very little about the radio industry as such to-day. We hope to know a great deal about it to-morrow. We stand four-square on the proposition that radio advertising must adhere to the truth, whether it be in the realm of merchandising, financing or service. We are willing to serve as the standard bearers, and we call to the colors, every clean-minded man who believes in the truth policy and who realizes that it will be a big thing for the industry, and a big thing for the business of advertising to keep the radio field clean from the start. Such men will, no doubt, readily agree with our view that it will be a great setback to the industry to have the public interest now so widely manifested, diminished by untruthful and extravagant claims. — NATIONAL VIGILANCE COMMITTEE, Associated Advertising Clubs, by H. D. Robbins, chairman.

This Firm Is "Radioizing" Phonographs

The phonograph is proving an ideal "speaker" for concerts and speeches sent by radio. The scientifically designed tone-chambers turned out by leading manufacturers enable a number of people in a room to hear, with remarkable clearness, everything "brought in" with a receiving-set having two or more steps of amplification.

The Essex Wireless Specialty Co., 31 New Street, Newark, N. J., manufacturers of the E. S. X. Wireless Talking Machine Attachment, has made exhaustive tests in employing the phonograph as a loud speaker. In a letter to the Trade Department of RADIO WORLD, this firm says:

"This attachment enables the owner of a radio receiving-set and a phonograph to utilize the carefully and expensively constructed tone-chambers, employed in the phonograph of today, as a loud speaker. In attaching the E. S. X., all that is necessary is to remove the sound reproducer from the talking machine and replace it with our instrument, allowing the leg to rest on the turntable. This insures proper height, which is absolutely essential in order to obtain full volume of sound."

The E. S. X. attachment permits the phones, or receivers, from any standard make of head set, and fits all the standard makes of talking machines. This firm seems to have produced an appliance that will "radioize" the phonograph.

IXE Claims Broadcasting Record

Editor, RADIO WORLD: With reference to the second issue of your magazine, which we think is a decided improvement on the first:

We note the item entitled "First to Broadcast," apparently an article emanating from the Publicity Department of the Radio Corporation or Westinghouse. The exact source of the item is not what interests me, but from reading the item one is apt to gain a false impression.

It is true KDKA was the first to broadcast Sunday church services regularly, but this corporation, operating a station in Medford Hillside, IXE, was the first to broadcast a regular daily schedule, when police reports for the City of Boston were sent out every night together with musical programs.

This "first" business is a mighty hard thing to prove. DeForest was broadcasting intermittently in 1915, and so were we. KDKA was the first to broadcast weekly, but we were the first to broadcast daily, which is quite a difference.

Please don't think that we are unmindful of the tremendous impetus to radio given by the Westinghouse stations. We realize they are preeminently leaders in broadcasting work, as must anyone else. My point simply is that this corporation was the first to broadcast on a regular daily schedule and is entitled to the proper credit

Mayor May Open Brooklyn Show

Mayor Hylan has been invited to open the radio show at the Brooklyn Ice Palace, May 6. This show promises to be a radio event of unusual interest. An antenna New York City, will be used.

This show will mark the first annual exposition of the Electrical Contractors' Association.

One of the contests announced will be conducted by the Brooklyn Council, Boy Scouts of America, who have been active in radio development for some time.

A motor generator for the operation and transmission of messages has been given the Brooklyn Contractors by the Crocker-Wheeler Company, Ampere, N. J. These are the motors used by the United States Government on aircraft and ships.

Communicate With Them

Editor, RADIO WORLD: Will you kindly advise as to who are the manufacturers of the following equipment for radio purposes, together with their addresses:

De Vean Loud Speaking sets.
Bowman Airophone Radio Receivers.—
GATELY-HAIRE CO., INC., 356 Broadway, Albany, N. Y.

* * *

Editor, RADIO WORLD: We are at present molding a large assortment of parts for radio apparatus and we are writing in case you get calls from your advertisers for such articles. We are making in Celluloid, Composition and Bakelite.—AUBURN BUTTON WORKS, INC., by C. H. Woodruff, Auburn, N. Y.

* * *

We are arranging to sell radio apparatus, as our Mr. Maxwell H. Hite is a practical electrician, having been electrician for the Pennsylvania Railroad, New York, and Philadelphia, for a number of years prior to taking up the auctioneering profession. He had considerable experience with wireless in years gone by, hence anything you facturers who need experienced sales agents can do to aid us in connecting with manu- will be greatly appreciated by MAXWELL H. HITE & SON, 422 S. 13th St., Harrisburg, Pa., per Wayne E. Hite

On the "Must" List

Editor, RADIO WORLD: I bought a copy of RADIO WORLD at a newsstand and found it to be about the best ever. In fact, it is without a peer in the field of radio publications.

My check for six dollars is enclosed. Put my name on the "must" list.

—DR. H. RILEY SPITLER, 2 Stotler Bldg., Eaton, Ohio.

as such. Our programs have been surpassed by the Westinghouse stations; but they are steadily improving as everyone in New England knows, and soon will be on a par at least with those of any station.—AMERICAN RADIO AND RESEARCH CORPORATION, Medford Hillside, Mass., H. M. Taylor, Advertising Manager.

Radio Merchandising (Continued)

Will All New Firms Join This List?

RADIO WORLD wants to keep its Radio Merchandising Department up to the minute in order that it will be of value to all engaged in every phase of the radio trade—a trade that is increasing daily, that will engage millions in capital create huge payrolls for skilled workers of both sexes, and draw considerable money from the fast-growing army of radio fans; for the day is certain to dawn when, so far as the American home is concerned, radio will be as popular as the phonograph, if not more so.

We begin in this number the publication of a list of dealers and jobbers in radio supplies in the United States. The list is classified by geographical sections, beginning with New England States. Watch for the name of your firm in your particular territory. If it is not recorded here, send it in for publication. It may mean business to you. Also send along any trade notes of interest—anything that may be of value to the radio trade.

Simply address your letter: "Editor RADIO WORLD, 1493 Broadway, New York.

North Atlantic States

(Continued)

B. & H. Radio Supplies, Paterson, N. J.
Paul R. Collier, 154 E. Front St., Plainfield, N. J.
F. S. Katzenbach & Co., Trenton, N. J.
Adams-Morgan Co., Upper Montclair, N. J.
Emerson Radio Apparatus Co., West Hoboken, N. J.
J. & M. Elec. Co., Amsterdam, N. Y.
Colby's Telegraph School, Auburn, N. Y.
Parlor City Electric Co., Binghamton, N. Y.
Radio Testing Station, 25 Sturges St., Binghamton, N. Y.
Kimley Elec. Co., 290 Winslow Ave., Buffalo, N. Y.
McCarthy Brothers & Ford, Buffalo, N. Y.
Bangert Electrical Co., Inc., Freeport, N. Y.
Hamburg Radio Supply Co., Hamburg, N. Y.
Bangert Electrical Co., Inc., Hempstead, N. Y.
White Electric Service, Hudson, N. Y.
Bangert Electrical Co., Inc., Jamaica, N. Y.
Radio Supply Co., Mt. Vernon, N. Y.
A. K. Laing Radio Co., Pelham Manor, N. Y.
Hickson Electric Co., Rochester, N. Y.
R. Schmidt & Co., Rochester, N. Y.
Northern Electric Co., P. O. Box 371, Schenectady, N. Y.
Hughes Electrical Corp., Syracuse, N. Y.
Mohawk Electrical Specialty Co., Syracuse, N. Y.
American Electric Appliance Co., 235 Fulton St., N. Y. City.
J. F. Arnold, 2082 Lexington Ave., N. Y. City.
Beacon Radio & Electric Co., 246 Greenwich St., N. Y. City.
Broadway Electric Novelty Co., 324 Bowery, N. Y. City.
Bronx Radio Equipment Co., 687 Courtlandt Ave., N. Y. City.
John M. Cross Co., Radio Dept., 859 7th Ave., N. Y. City.
Economy Products Corp., 253 Broadway, N. Y. City.
Electric Service Engineering Co., 105 W. 47th St., N. Y. City.
Empire Radio & Equipment Co., 271 W. Brooklyn, N. Y.
John Firth & Co., 18 Broadway, N. Y. City.
H. Goldberg, 1373 3rd Ave., N. Y. City.
Hoyt Elec. Co., 686 Lexington Ave., N. Y. City.
The Haynes Radio Shop, 629 Lexington Ave., N. Y. City.

Howells Cine Equipment Co., 729 7th Ave., N. Y. City.
Hygrade Electrical Novelty Co., 41 W. 125th St., N. Y. City.
Kelly & Phillips, 312 Flatbush Ave., Brooklyn, N. Y.
Liberty Radio Co., Church and Liberty Sts., N. Y. City.
Long Island Wireless Telephone Co., 1173 Gates Ave., Brooklyn, N. Y.
Meade Bakelite & Radio Apparatus Co., 522 Central Ave., Brooklyn, N. Y.
Mutual Purchasers Ass'n., 2 Stone St., N. Y. City.
N. Y. Wireless Telephone Co., 82 Flatbush Ave., Brooklyn, N. Y.
Phenix Radio Supply Co., Room 29, 16 Court St., Brooklyn, N. Y.
Radio Co. of N. Y., 1674 Broadway, N. Y. City.
Radio Service & Mfg. Co., 110 W. 40th St., N. Y. City.
Radio Specialty Co., 96-98 Park Place, N. Y. City.
Radio Stores Corp., 146 W. 34th St., Store 16, Pennsylvania Arcade, N. Y. City.
Rooney Co., 1451 St. Nicholas Ave., N. Y. City.
Charles G. Rosewall, 93 Flatbush Ave., Brooklyn, N. Y.
Ashtabula Radio Sales Co., 49 McGovern Ave., Ashtabula, O.

(To be continued)

New Broadcasting Station

Editor, RADIO WORLD: We wish to inform you that the K & L Electric Company has opened a broadcasting station at 427 Olive Street, McKeesport, Pennsylvania.

The particulars are as follows: Call letters, WIK. Wave length, 360 meters. Schedule of operation, Sunday 1:30 to 2:30 p.m., 6:30 to 7:00 p.m.; and 6:30 to 7:00 p.m., daily. 9:30 to 10:30 Tuesday and Thursday. Range, 500 miles.—K. & L. ELECTRIC COMPANY, per Hunter J. Lohman, manager

Klosner Moves

The Klosner Improved Apparatus Company originators and sole manufacturers of the Klosner Vernier Rheostat, has moved to its new and enlarged offices at 2024 Boston Road, New York City. Its new factory is now in full production and immediate shipments are being made. The Klosner Company is arranging to manufacture other radio specialties and will shortly have an announcement to make regarding their new products.

New Radio Firms and Corporations

Radio Supply and Service Corp., Manhattan, \$5,000; R. F. Alfaro, M. Droder, J. T. Simms. (Attorneys, Gold & Unger, Equitable Building, 120 Broadway, New York, N. Y.)

Seaboard Radio Corp., Manhattan, \$10,000; I. R. and S. Isaacs. (Attorney, S. S. Isaacs, 266 Grand St., New York, N. Y.)

Radiogem Corp., Manhattan, make wireless apparatus, \$10,000; T. Banilower, S. Holtzman. (Attorney, H. S. Wallenstein, 233 Broadway, New York, N. Y.)

Simon Radio Corp., Del., 500 shares preferred stock, \$100 each; 1,500 common, no par value; rep., T. I. O'Malley, 42 Broadway, New York, N. Y.)

Washington Radio Corp., radiophones, \$250,000; David L. Riordan, Jacob N. Halper, R. S. Knapp, Washington. (Capital Trust Company of Delaware.)

Atlantic Radio Corp., Wilmington, Del., apparatus, \$200,000. (Register and Transfer Co.)

Radio Distributing Corp., apparatus, \$100,000; Frank Jackson, Dover, Del. (Capital Trust Co. of Delaware.)

Superior Radio Inc., Philadelphia, apparatus, \$100,000. (Corporation Guarantee and Trust Co., Philadelphia, Pa.)

Newfane Electric Co., \$20,000 to \$100,000.

Standard Radio Corp., Wilmington, Del. Receive and utilize electromagnetic waves, \$500,000. (Corporation Trust Co. of America.)

Broadcast Radio Corp., Manhattan, \$20,000; E. Friedman, A. H. Kestenbaum, D. Wachsstock. (Attorney, M. M. Helfgott, 35 Nassau St., New York, N. Y.)

Wireless Appliance Corp., Manhattan, 1,000 shares common stock, no par value; active capital, \$5,000; L. Freed, S. E. Stott, H. J. Conhaim. (Attorney, J. H. Buck, 2 Rector St., New York, N. Y.)

Louisville Hydro Electric Co., Wilmington, Del., \$1,000,000. (Corporation Trust Co. of America.)

General Radio Corp., Philadelphia, radiophones, \$1,000,000. (Corporation Guarantee and Trust Co., Philadelphia, Pa.)

Short Cut Radio Corp., New York, apparatus, \$100,000. (U. S. Corporation Co.)

Pioneer Radio Corp., Manhattan, \$20,000; M. G. Stark, J. Friedman, F. W. Kristeller. (Attorneys, Watson, Kristeller & Swift, 58 William St., New York, N. Y.)

Rex Radio Sales Corp., Manhattan, \$5,000; S. Prince, L. Frank, A. Greenwald. (Attorney, I. Lowenbraun, 116 Nassau St., New York, N. Y.)

Rex Radio Sales Corp., Manhattan, \$7,500; M. L. Urdang, J. Forman. (Attorney, A. Lipton, 150 Broadway, New York, N. Y.)

Rialto Radio Corp., Manhattan, \$10,000; J. D. Basson, J. La Rose, A. Meyer. (Attorney, A. Falck, 2 Rector St., New York, N. Y.)

Radio Publishing Corp., Manhattan, \$300,000; C. J. Glidden, E. P. Brinegar, C. R. Carpenter. (Attorney, F. J. Knorr, Albany, N. Y.)

Radio Winding Corp., Bronx, \$10,000; E. A. Gersbach, A. Lemlein, H. B. Salzberg. (Attorney, P. Lewenson, 5 Beekman St., New York, N. Y.)

Wizard Battery Co., Manhattan, \$10,000; J. L. Lotsch, M. Lanzit, E. Friberg. (Attorneys, Schechter & Lotsch, 34 Wall St., New York, N. Y.)

Radio and the Woman



(c. Underwood & Underwood)

The second lady in the land, Mrs. Calvin Coolidge, wife of the Vice-President of the United States, is one of the most ardent radio fans in Washington.

DO you know that a certain famous costumer on the Place de la Madeleine, Paris, is the first dressmaker to use the radiotelephone in his designing rooms? It seems to me that this belief in the inspirational value of music reveals not only artistic, but keen business sense.

* * *

It is interesting to note that an automobile club plans to make wireless the medium for informing motorists of the conditions of roads so that travellers starting on a trip will be prepared for every emergency. What feminine member of any motoring party wouldn't be glad to know in advance just what amount of comfort a contemplated journey portends?

* * *

A woman living on a lonely western ranch writes that her only entertainment comes by radiophone.

* * *

When the choice lies between a radio concert or a victrola or phonograph, many prospective brides are showing decided preference for the first named. One girl who, far in advance of the wedding date, has been presented with a handsome talking-machine, even contemplates having it remodeled to hold a receiving set.

* * *

A dedication on the flyleaf of a book

on wireless telegraphy, states that it was a certain woman's encouragement and assistance in the gathering and preparation of material for the voice that enabled the author to write the book.

* * *

What earthly chance has the profiteer in eatables, when righteously indignant housewives offer incontestable proof that his inflated prices do not agree with their latest "Marketing for the home" radio report?

* * *

It is not so much a question now as to whether or not little Mary or John shall take turns winding up the talking machine, as it is who shall have use of the head set.

* * *

Among the dainty home-furnishings of a certain prospective June bride, is as cleverly designed a receiving-set cover as ever has been seen in the somewhat *passe*, silk-and-gold hoop-skirted lady whose beruffled gown has hitherto effectively concealed disfiguring telephones.

* * *

With so many interesting accounts coming in of the radio activities of boys' clubs, it is surprising that so enterprising an organization as the Girl Scouts cannot show a record of equally successful experiments. I prophesy, however, that by the end of

the summer, events will prove these practical, energetic girls to be as progressive as ever mere males could be.

* * *

Mary Allan Stuart, authoress of many published juvenile poems, lays emphasis on the fine courtesy and splendid co-operation extended her by officials of the Westinghouse station. On May 1 some of her poems are to be broadcasted. Her "George, the Engineer," will be enjoyed by all who happen to listen in.

* * *

Looking into the future, I am certain that it will be well for the girl about to select a career to consider thoroughly the possibilities for progress and remuneration in this new, fertile, and uncrowded field.

* * *

One who has wearied of her job of playing a piano in a motion-picture house, voices her belief that when her resignation is accepted, the theater's up-to-date business manager is going to entertain his future audiences by means of wireless telephony.

* * *

To the intelligent, energetic woman forced to live within her own small circle through devotion to home and children, the radiotelephone will bring soul's surcease.

* * *

One dear girl, who, because of ill health, is forced to miss her last term at school, plans to do two things this summer: one is, that since her receiving set is the only one in the neighborhood in which she lives, she intends to cover the expense of a tutor by money made from running a tea room whose chief attraction will be a radio concert. The other is to pay close attention to lectures and educational talks broadcasted, so that with knowledge gained from these added to what she has already derived from her tutor's instructions, she will be prepared to face the stiffest sort of examination next fall.

* * *

A little woman living in Huntington, West Virginia, sends word that, on Sunday last, her amateur receiving-set enabled her to listen in on a church service held in East Pittsburg. On Tuesday night, she enjoyed a Westinghouse concert.

* * *

Feminine fancies in my mail:

A student, who evidently intends taking up the study of wireless very seriously, bemoans the fact that though the meaning of the various



(c. Keystone View Co.)

One housewife finds the radiophone an aid in her daily work. Gramophone selections were transmitted from the Marconi Wireless Telegraph Station at Writtle, Essex, England, on a wave length of 700 meters. The music went into dozens of homes where radios were installed—to the delight of the women who did the housework.

kinds of rays, namely: "actinic," "light," "heat," "electric" and "X-rays," are clear enough, the wave terms puzzle her. Consequently she asks for a letter which will differentiate "pressure" waves from "electric" waves.

A school girl writes to ask if the word "oscillatory" as used when referring to "an oscillatory circuit" was derived from the verb—osculatory.
* * *

One who signs herself "A Chorus Girl" wants me to inform her as to

whether or not our terms, "electric wave," "coils," "wave lengths," and so on have anything to do with a coming mode of hair dressing.
* * *

A nervous invalid who prefers to introduce herself as "Not a Spiritualist," says that though she is intensely interested in this new science and is eagerly awaiting the installation of a receiving set which she has purchased, she still entertains a few tremors regarding the various "mediums" to which we so often refer. She asks just what do we mean by that.
* * *

A farmer's wife writes to ask if the term "auto-jigger," which so many amateurs use, really relates to wireless or if it is a new Ford joke.
* * *

A woman mineralogist writes that lack of time has prevented her from taking up the study of radio, but that a recent allusion of ours to certain "crystals" has made her investigate.
* * *

A girl who describes her occupation as being that of a 'cello player in an orchestra, asks what we mean when we use the phrase, "out of tune."
* * *

A young accountant wishes me to explain the difference between "statics" and "statictics." Just a little difference.—R. R. G.



(c. Fotograms, N. Y.)

Miss Winifred Taylor, of New York, goes in for two amusements at the same time—her canter and radio. Of course, she must have aërials and a ground wire; but every radio set is not complete in a photograph. If passengers can listen in while traveling on a passenger coach, what is to prevent a young lady from utilizing radio while taking her morning canter through the park.

RADIO WORLD'S QUICK ACTION CLASSIFIED ADS

This department is intended for everybody who wants quick action on short announcements covering the buying, selling, exchanging or general merchandising in the radio field. Readers of RADIO WORLD will find that it pays to read these columns every week. Advertisers will get a five-day service here—that is, copy received for this department will appear in RADIO WORLD on the news-stands five days after copy reaches us.

The rate for this RADIO WORLD QUICK ACTION CLASSIFIED AD. DEPT. is 5c. per word (minimum of 10 words, including address), 10% discount for 4 consecutive insertions, 15% for 13 consecutive insertions (3 months). Changes will be made in standing classified ads., if copy is received at this office before 4 P. M. on any Thursday preceding date of publication. RADIO WORLD CO., 1493 Broadway, New York City. (Phone, Bryant 4796.)

ROGERS RECEIVING RADIOMETER: New patented variometer for panel mounting. Simple, compact, efficient, \$4.00. Build your own receiver. Two radiometers one variable condenser, directions and wiring diagram, mailed upon receipt money order \$10.00. Rogers Radio Company, 5133 Woodworth St., Pittsburgh, Penna.

Government Positions. Men, women, 18, over. Wanted for Railway Mail, Postoffice, other Government positions. Examination soon. Salary \$1,400-\$1,500 year. Experience unnecessary. Particulars free. Write Columbia School of Civil Service, 383 Pope Bldg., Washington, D. C.

HIGH GRADE ANTENNA WIRE. Best quality, 7 strand No. 22 trimmed copper, non corrosive antenna wire. Only 19 per foot. The Kehler Radio Laboratories. Dept. W. Abilene, Kansas.

HAVE YOU A RADIO SET?—If not try my system in getting one. I sell at reduced prices, batteries, tools, sporting goods, merchandise of all kinds. Try me. Anderson, 340 Park Ave., N. Y.

CODE CHARTS—Containing alphabet, number, punctuation and Q abbreviations. Two sizes, 12 x 16 @ 25 cents and 24 x 30 @ 50 cents. If your dealer does not handle them, we will mail them postpaid upon receipt of price. H. C. Wiley, 48 Monroe St., Hartford, Conn.

WE BUY second hand radio goods, any description. Columbus Shop, 874 Columbus Ave. (103d). Open evenings to 10 o'clock.

LEUMITE the ultra-sensitive detector crystal, postpaid 25c. LEUMAS LABORATORIES, 311B Fifth Ave., New York.

20,000 Meter Loose Coupler, \$12.00; Navy Crystal Detector, \$2.00; De Forest Weatherproof Model Detector, \$1.50. Act quickly. Jones, Hamilton Beach, N. Y.

HAWK-CRYSTAL SETS—HAWK Complete with head sets and aerial. Guaranteed 25 miles. Special \$15.00. Expert layouts of Regenerative Sets and Radio Devices Free. HAWK RADIO SUPPLY CO., 558 Melrose Ave., Bronx. Opp. Miner's Theatre.

Amateurs' attention. We are four blocks from the Grand Central. We have sets for immediate delivery, also tubes, phones, variometers, couplers, condensers, etc. Mail orders receive prompt attention. Evenings 7 P. M. Murray Hill Electric Co., 214 East 38th St.

Receipt by new subscribers of the first copy of RADIO WORLD mailed to them after sending in their order, is automatic acknowledgment of their subscription order and payment therefor.—(Adv.)

FOR SALE—Beautiful Quartered Oak Rolltop Secretary Desk and Typewriter. Desk to match very little used. S. D. Hayden, 1493 Broadway, Room 223.

100 ft. 7 strand Copper Aerial Wire \$.71
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Nickel Plated Contact Points doz. .20
Nickel Plated Switch Arms57
Brach Lightning Protectors 2.37
Porcelain Vacuum Tube Sockets58
¼ inch Slider and 10 inch Rod45
Coils wound on Tube75
Crystal Detectors, (N. Y.) 1.20
Mounted Tested Galena25

LIBERTY RADIO CO.
Church and Liberty Streets, New York City, N. Y.
Phone Rector 3432

RADIO LICENSES—Our booklet tells you how to obtain a government transmitting license, 20 cents. Howard Frazier, 5714 Hazel Ave., Philadelphia.

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Complete your files by getting the first numbers of RADIO WORLD and save them so that you can have 52 copies bound at the end of the year. If your newsdealer cannot supply you with the copies he can get back number through the American News Co. and its branches, or copies at 15 cents each, will be sent direct from publication office, or better still, subscribe and have your subscription start. RADIO WORLD CO., 1493 Broadway, New York, N. Y. (Adv.)

Subscribe for Radio World by the year and be sure of not missing an issue. (Adv.)

Audion receivers direct from manufacturer, handsome cabinet, bakelite panel and dials, 150 meters to 3,000 meters. \$29.50 unassembled \$20 postpaid. Crystal sets in cabinet \$10 unassembled \$7 postpaid. Stamp for full details of these and other outfits, dealers supplied, agents wanted. Edward T. Collins, 8522-101 Richmond Hill, L. I., N. Y.

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RADIO WORLD CO.

1493 Broadway, New York City.

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Three columns, 147 lines each—441 lines to the page.

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All plates should be mounted. We can use screens up to and including 133. We prefer 120 screen half tone. We cannot use matrices.

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Advertiser Gets 500 Replies from One Half-Page Advertisement in Radio World

Howells Cine Equipment Co., Inc.

Executive Offices

729 SEVENTH AVE., NEW YORK, U. S. A.

April 19th, 1922.

RADIO WORLD,
1493 Broadway,
New York City.

Gentlemen:

We wish to state we have received over five hundred inquiries, within the last few days, from the half-page advertisement which we put in your "Radio World," issue of April 15th, 1922.

I think this sure is some advertising medium.

Very truly yours,

HOWELLS CINE EQUIPMENT CO., INC.

By (Signed) J. C. HORNSTEIN,
General Manager

G

JCH

Stations Worked and Heard

RADIO WORLD, in this issue, inaugurates a new department, "Stations Worked and Heard," and will publish the lists of all amateurs who keep a record of what comes over the ether waves into their receivers. When preparing your list write it out similar to the one appended:

Be sure to give your own call and write out the calls you receive, separating them in groups. Special attention should be given as to whether spark, phone, or C. W. was received.

E. Brown, and W. T. Scott, 2127 Steven's Court, N. W., Washington, D. C.

Heard: April 1 to 15. CW,—1 CN, 1 YK, 1 ARY, 1 AWE, 1 BGF, 1 BQE, 1 BTC, 1 BQE, 1 BTC, 1 BWJ, 1 CIK, 1 BTL, 1 ICNF.

2 RY, 2 WT, 2 ZK, 2 AWF, 2 BEA, 2 BEH, 2 BGI, 2 BML.

3 BZ, 3 CC, 3 IL, 3 ZY, 3 AJO, 3 BOF, 3 BXA.

4 BQ, 4 CO, 4 GL, 4 ZC.

5 DA.

8 AO, 8 DV, 8 IQ, 8 PO, 8 QZ, 8 RQ, 8 GE, 8 ZR, 8 ANB, 8 AOO, 8 ASK, 8 BDU, 8 BJ, 8 BEF, 8 BIL, 8 BPU, 8 BSY, 8 CAZ, 8 CBJ.

9 CT, 9 ARK.

KYW, KDKA, NOF, WGY, WJZ, WOH, WWJ.

Radiogleanings

OVER 600,000 persons in the United States now own apparatus with which to receive radio messages

About one-tenth of the population of the United States can be served by WJZ, the Newark, New Jersey, broadcasting station.

The physics department of the University of Wisconsin broadcasts over a radius of sixty miles in broad daylight and further at night.

Considering comparatively short distances, the cost of wireless-telephone receiving-apparatus is about \$1 for every mile of distance from the transmitter.

The report that Iowa and Nebraska farmers may listen to broadcasting from Newark, Pittsburgh, or New Orleans would imply that the middle westerner is expected to use a multiplex-vacuum-tube radio-equipment.

The remarkable growth of the radio art for all sorts of purposes, has caused considerable confusion in the air and inefficiency in all radio service. This must be overcome.

The oldtime amateur radio operator knows most of the broadcasting stations by the sound of their sparks. Some are identified by the peculiar note of the spark transmitter, others by the high speed with which messages are sent, and so on.

According to the Western Electric Company, some of its broadcasts from the roof of the West Street Building, New York, have been heard 3,000 miles away. The longest recorded distance was the pick-up of the steamer "E. L. Drake," 1,000 miles west of San Francisco.

The proficiency of United States Navy operators was proved recently when a competitive radio-drill was held among the destroyers of the Pacific fleet. Seventy-three ships were represented. Six squadrons attained 100 per cent., one 99 per cent. None had a record below 83 per cent.

California with 26 broadcasting stations, heads the list of States; Pennsylvania ranks second with 11; New York, third, with 9.

Demands of summer campers already indicate that radio sets will take the place of cameras and phonographs this year.

A Sample General Electric Program

FRIDAY, APRIL 28.

SPECIAL PROGRAM

11:30 P.M. EASTERN TIME

Medley of Popular Airs—from "Bombo" Jolson.

Cain's Castle Orchestra under direction of R. E. MacDermott, pianist. W. J. Healy, violin; E. Von Hynning, violin; T. Nessler, cornet; J. Maly, cello; C. Rowe, saxophone; Al. Voight, saxophone; C. B. Roberts, flute; K. E. Snell, bass; E. Shear, Xylophone and drums.

Venetian Love Moon.....Feist Cain's Castle Orchestra.

Kentucky BluesFeist Saxophone Duet—C. Rowe and Al. Voight.

Good Bye Shanghai—Fox Trot....Remick Cain's Castle Orchestra.

TeasingStern Xylophone Solo—E. G. Shear.

(a) Sapphire SeasWhitmark (b) Angel ChildLang

Cain's Castle Orchestra.

La CampanellaLiszt Piano solo, "Duo Art," by Ferruccio Busoni.

No use Crying—Fox TrotHirsch Cain's Castle Orchestra.

Answers to Readers

WITH a crystal receiver-set, I can pick up the music from Newark clearly. The aerial is a single wire about 100 feet long. On bringing the set to Brooklyn, I found out that I was unable to pick up Newark; but due to the fact that I was using a shorter aerial of 50 feet, spark signals were audible. Could you tell me what might have been the trouble?—J. C. K., Brooklyn, N. Y.

Your aerial is too short. A double wire will not make it 100 feet long. The broadcasting may be picked up in certain sections of New York very well; but there are certain sections that are practically dead, and due to the high buildings and steel bridges, a greater part of the energy is absorbed. Would advise you to put in a vacuum-tube outfit for better results.

Is any danger from lightning on an inside aerial?—C. J. S., East Orange, N. J.
No; there will be no danger, but would advise you to ground any aerial whether inside or outside.

In reference to the single five-watt tube-set in the RADIO WORLD of April 1, 1922, can 500 volts direct current, stepped down to 350 volts, be used in place of 220 volts and 130 volts "B" battery? Can the whole 500 volts be used or is it too high?—H. P., Town of Union, N. J.

You can probably secure an extended reply to your question by corresponding with the writer of the article, Frank A. Hanhel, 214 East 38th Street, New York.

I have a set which has a wave-length of 175 to 1,000 meters, and would like to know if I can secure something that will increase my wave length from 1,000 meters to 3,000 meters?—C. A. H., Staunton, Va.

Visit your nearest dealer and ask if you can purchase any loading coils that will carry you to the wave-lengths desired. They should be inserted in series with primary and secondary windings of coupler.

Could a two-step amplifier be added to a set using one vacuum tube? Will a single-wire aerial, 75 feet long, be as good as one of the same length composed of two?—A. R. D., Paterson, N. J.

You may add as many amplifiers as you desire, in connection with tube for detector. A single-wire aerial will give you same results as a two-wire aerial composed of the same length.

Do all regenerative circuits come under the Armstrong patent?—C. H. P., Brooklyn, N. Y.

The Armstrong patent is a basic patent and covers all circuits pertaining to regeneration; or, in other words, anyone who employs any type of a feed-back directly or indirectly in the plate circuit, is infringing on his patents. Recent court decisions seem to uphold this patent as standard. All regenerative circuits are practically Armstrong circuits.

I have a receiving set comprising the following equipment. Loose coupler, crystal detector, variable condenser, phones, and a fixed condenser. I receive signals from spark stations very clearly; but, somehow, cannot pick up the music. What seems to be the trouble?—C. L. E., Flatbush, N. Y.

Use your variable condenser in series with your antenna; this, in turn, would give you a range so as to reduce your wave length down to the desired wave. Experiment awhile. With a few trials you

Owing to the large numbers of questions received from readers it is impossible to answer all in this number. Your replies will appear in the next or future numbers of Radio World.

should succeed. Be sure you have your fixed condenser shunted around your telephones.

Please tell me what method I could use to tell the polarity of the d. c. supply in my home. I have 110 volts d. c., and wish to cut it down for charging.—G. S., Philadelphia.

Make sure you have d. c. before you start to do anything. This information can be had by simply asking the company who supplies the current. If they advise you that d. c. is available, simply take a raw potato, peel it and place your two leads into the potato keeping them about an inch apart. The result will be that a green spot will appear around the positive wire. Another method is to place the two leads in a glass of water, also keeping them apart. As a result, the negative wire will form bubbles which will rise to the surface. A wise stunt is to place, or tie, a knot in the positive wire, as this is a symbol used by all radio experts.

Would there be any advantage in using two galena detectors?—G. M., Detroit.

Using two crystals will be of no advantage to you with such an arrangement. This will benefit you if you care to have a spare detector to use in case one gets oiled and spunky.

Is No. 22 wire O.K., for a variometer? Should the stator and rotor have the same amount of wire on it?—J. M. K., Hoisington, Kansas.

This size is advisable, but No. 24 would be more suitable. There must be just as many turns on the stator as on the rotor.

How far can I receive on a crystal set from a broadcasting station?—W. D., Grantwood, N. J.

You cannot expect to receive over 25 miles with a good crystal detector. You might be able to receive a little farther under ideal conditions, but you could not depend on a distance beyond that mentioned.

Can I use a 2,000-ohm and 3,000-ohm receiver? How can I connect them?—H. M. G., Kingston, N. Y.

These receivers can be connected in series, but should be of the same ohmage.

My receiving set consists of the following apparatus. A spider web-inductance, a vacuum tube, a socket, and rheostat complete, a fixed condenser, a variable condenser, and a set of 2,000-ohm phones. My aerial is 75 feet long, can I hear WJZ? Will red-seal batteries, which are usually used for bell work, be serviceable for my vacuum tube, instead of a large storage-battery used for automobiles?—H. L., New York City.

You describe your apparatus, but we are without a diagram of your circuit. However, if your set is hooked up correctly, you should hear WJZ. Regarding your batteries: secure a storage battery, as dry batteries will last you only a short time. In case you should add an amplifier, your

storage battery could supply the necessary current to light the tubes. By all means get a storage.

Can I use a step-down transformer that has steps from 3 volts to 24 volts, for current to operate a spark coil that has a spark length of $\frac{1}{2}$ inch?—A. H. E., Brooklyn.

Yes. You can use a step-down transformer with a spark coil. Proper care should be taken in adjusting the vibrator for satisfactory results, using approximately about six volts.

Show a hook-up using three honey-comb coils, variable condenser, and a audion detector?—A. C., New Haven, Conn.

The hook-up for these instruments, appeared in RADIO WORLD No. 4, dated April 22, 1922.

When a tickler coil is used, is it necessary to have it near the receiving coils or loose coupler, or can it be placed anywhere on the panel?—O. E. C., Galion, Ohio.

The tickler coil should be mounted so that the coupling between this coil and the secondary is adjustable.

Could A. C. be used for the filament or grid of a 50-Watt-power tube?—M. V. E., Amagansett, N. Y.

A. C. may be used to light the filament of a power tube; but a D. C. voltage is needed for the grid voltage.

Can one step of radio-frequency amplification be attached to any type of audion receiving set?—S. E. M., Cincinnati, O.

A one-step frequency amplifier may be used with any type of audion receiving-set. For long-waves resistance coupling may be used. For short waves use a tuned circuit.

Will a metal roof have any effect on the aerial which, I would say, is about ten feet over the tin roof?—M. H. C., Albany.

If your roof is grounded, then the antenna would have only the effective height if the wires were only ten feet above the ground. The grounded roof would really bring the ground up to your antenna.

Advise me regarding the following set which I have constructed. I would like to know if the set is wired for best results. What capacity I should use for fixed condenser?—H. S. T., Troy, N. Y.

Your diagram is completely wrong. In RADIO WORLD, No. 6, (published May 6), we will present a correct detector and two-step amplifier, the proper method of wiring and all other necessary data.

We are unable to have a roof aerial and want advice on a loop. Have an idea that by having a 2-foot loop, we can put the loop outside a third-story window, have open space of 100x50 feet in rear. With an eight-story building on one side, can we get Newark on a crystal-detector set. Do you think this possible? How much wire is needed on the loop?—H. C. H., New York City.

See RADIO WORLD No. 2, page 20, for loop aerials; also No. 4, page 6.

Can I add a two- or three-coil mounting with proper coils to increase the wave length of a short-wave regenerative set?—C. F. Y., Pottstown, Pa.

RADIO WORLD of April 22, page 4, explains your question fully.

How to Construct the Variocoupler

By Frederick J. Rumford, A. I. E. E.

THE variocoupler is a very efficient piece of wireless apparatus. It really takes the place of the loose coupler. It is primarily used for simple two-circuit receiving outfits in conjunction with either a crystal detector or a vacuum tube. It is also used extensively in regenerative receivers in conjunction with a pair of variometers, namely the grid and the plate, with a vacuum tube.

This variocoupler is easily made up at little expense. First the builder must purchase two gray seamless cardboard tubes of the following dimensions: The primary, or stator, is $4\frac{7}{8}$ inches in outside diameter and 2 inches in length. When he has obtained these tubes, he should take the primary tube and measure down from the top $\frac{3}{8}$ of an inch and drill so as to allow for the passing through of the $\frac{3}{16}$ of-an-inch-diameter brass shaft. He will then take the secondary tube and drill in the exact center for the same purpose. He must drill also in the primary tube the following holes: Measuring down about $\frac{1}{2}$ inch from the top, half way between the two shaft holes, a hole for a binding post and another hole $1\frac{1}{8}$ inches from the bottom. This hole is for the second binding post. There are still two more holes to be drilled in the primary tube. These are for the purpose of securing the angle brackets which will hold the variocoupler to its base. These holes are left to the amateur's judgment. Now, there are

two holes to be drilled in the secondary tube $\frac{1}{4}$ of an inch in from each edge. These holes are for the two necessary binding posts. After all the holes have been drilled in both tubes, the amateur should give both tubes a couple of good coats of shellac, inside and outside, and then let them dry.

He is then ready to wind the primary coil which, in this particular instance, should be wound with No. 24 D.C.C. magnet wire, starting $\frac{3}{4}$ of an inch from the top and continue for 2 inches with taps taken at the following turns—the 10th, 18th, 28th, 36th, 40th, 54th, 64th, and the 74th, the last tap, making 74 turns in the whole winding. The starting and the finishing points are fastened, or connected, to the binding posts mentioned above.

The completed coil is then given a couple of coats of good shellac and left to dry.

Now that the primary tubes are wound, he should proceed to the winding of the secondary tube which, in this particular instance, is wound with No. 28 D.C.C. magnet wire. He should start the winding $\frac{1}{4}$ inch in from the edge and continue until he has covered one-half inch which will make 24 turns. He must continue on with the winding after leaving the usual one-half inch space in the center for the shaft until he has covered another half-inch of winding which should bring him $\frac{1}{4}$ of an inch from the end. He must connect the start

and the finish of his windings to the binding posts on the tube itself. The secondary has 48 turns of wire in all. After the secondary coil is wound completely, it should be given several good coats of shellac and then left to dry.

The builder must now purchase a length of 10/24 threaded shaft, or brass rod, and force it through the holes provided for it in both the coils, having the nuts forced tight up against the walls on the inner and outer sides of the secondary tube and also at the outer wall of the primary tube. These nuts may be soldered to the shaft, which will prevent their working loose, as the secondary is rotated within the primary tube.

He should now purchase a Clapp-Eastham, 3-inch dial—this is suitable for the 3/16-inch shaft—and screw the dial firmly upon the shaft at the front end of the coil, or variocoupler. The variocoupler is then completed with the exception of the panel which the taps should connect to the contacts thereon and the mounting. The above exceptions are left to the amateur's own judgment.

This outfit is good for about 500 meters. The wave-length can be increased by shunting a fixed condenser across the secondary posts. Use a condenser of a given capacity.

An outfit similar to this would cost the purchaser from \$4.00 to \$10.00 if he were to buy it in a radio supply store, already made up.

Will Antenna and Aerials Be "Scrapped?"

The so-called loop-antenna is increasing in popularity, and a number of amateurs are experimenting with plans to cut out the sky-high antenna. In fact, there seems to be a growing tendency to get away from the antenna. This is feasible, provided one has a complete set of vacuum-tube amplifiers.

The beginner is also assured that he cannot do without the aerial; but evidence is being gathered that any fairly accomplished amateur, equipped with a regenerative receiving-set modern type, may pick up messages with a compact tuning-coil, and omit the aerial to which this part of the apparatus is usually attached. Putting his aerials in position is the one phase of installation found most troublesome.

"Rah-Rah!" Boys Put 'em Over the Ether



(c. International)

Howard Coy, Raymond Cowley, Howard Brideman, and Harry Hardin, University of Southern California glee club now entertain their friends and relations by broadcasting their college songs.

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Galena Cup 10c., each

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Order.**

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Receiver Magnets Remagnetized While You Wait

If your ear pieces are weak you can not
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Head Sets, Vacuum Tubes, Acme
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**RADIO WORLD IS READY FOR
YOU EVERY WEDNESDAY**

Air Mail and Radio

The Post Office Air Mail Service is
planning to equip its big trans-con-
tinental planes with radiophones. The
first one to be so equipped was flown
to Washington from Chicago, re-
cently, in just two minutes over six
hours. Pilot E. Hamilton Lee made
the trip of 715 miles at the rate of
119 miles an hour.

This type of mail plane will be
equipped with both receiving and
sending radiophones having a radius
of 200 miles, so that the pilot may
keep in touch with the station he is
leaving and the one to which he is
flying.

The Ball Game at Home

At the opening game between the
Washington "Senators" and the New
York "Yankees," a Washington
"Herald" writer covered the story,
probably for the first time in history,
with a radiophone. From the time the
first batter stepped to the plate until
the last one went out, all local radio
fans got the game inning by inning,
if they listened in. Hereafter, when
the Washington team is in its home
town the radio reporter will cover
the game for all who cannot attend.



THE HOME RADIO HOW TO MAKE AND USE IT

By A. Hyatt Verrill

At last! A simple explanation of the mak-
ing and use of a home radio outfit. Every
step in construction is carefully directed and
illustrated with numerous working diagrams.
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Attractive, snappy result getters.

Merchants Signs Service Co.,
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VARIOMETERS

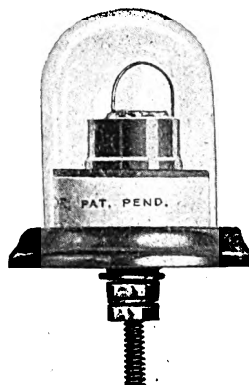
(Unwired)

Unwired Variometer blocks. Wood turned Cup Mahogany, Ball
made of white wood. Nicely trimmed and ready for wiring. Can
be had in all sizes varying from 200 meters to 500, especially
adapted for Short wave reception. Prices upon request in any
size lots, also sold separately. Workmanship guaranteed.

The Ever Ready Woodworking Co.

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(Actual Size)

IN USING

THE "GREWOL" RADIO DETECTOR

All Troubles Are Eliminated

This Detector Is Always Set and Ready

PRICE, \$2.00

Dealers write for proposition.

RANDEL WIRELESS CO.

9 CENTRAL AVENUE, NEWARK, N. J.

Sole United States Distributors

Radiotelephone Will Become a Necessity

There are people living to-day, not so very old at that, who can remember when there were only fourteen or so telephones in the largest cities, says "Radio Broadcasting News." These people also remember the curiosity which centered around these installations, and the fact that there was nobody to talk to over them, particularly if the other twelve or thirteen people with telephones were strangers. Calling central for the time of day was quite a diversion in those days and the proud youngster given the honor perhaps still remembers the incident.

After a time the telephone became a fad of the well-to-do; then it gradually was accepted by the business houses; then it went into private homes and today it is a necessity of our civilization. Millions of telephone calls are now made hourly in the United States.

The development of radio telephony has now passed the fad stage and while it is not yet a necessity, it is in the intermediate period, where it is being taken into the homes of all classes of people. Its greatest expansion and usefulness is yet to come.

The Pinnacle Reached

When the president of the American Telephone and Telegraph Company, from his home in Connecticut, conversed with the captain of the United States liner "America," 370 miles out from New York, says the New York "World," the highest pinnacle apparently was reached in the development of wireless communication. The imagination can not go much farther without accepting telepathy as being among the practical possibilities. There will be great improvements, of course, in radio telephony, but no radical change in the essential features seems likely. It is estimated that 200,000 persons heard the conversation between the telephone company officer and the captain of the steamer. They were amateur radio operators who "listened in." The absence of privacy in radio communication is objectionable, and may prevent its wholly superseding the "old-fashioned" telephone and telegraph.

Receipt by new subscribers of the first copy of RADIO WORLD mailed to them after sending in their order, is automatic acknowledgment of the receipt at this office of their subscription order and payment therefor.



BULBS
Amplifier \$6.50
Detector \$5.00

DeFOREST EVERYMAN SETS PINK-A-TONE SETS

Complete
with
Phones

\$25

Variometers

\$5.00

Variocouplers

"B" Batteries, 22½ volts \$.80

Moulded and Nickel sockets75

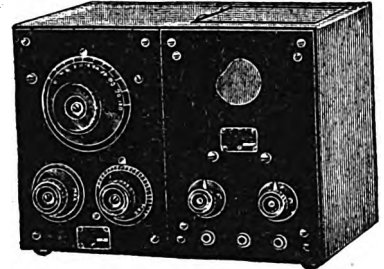
3-inch Moulded Dial 1.25

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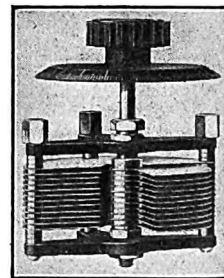
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DEALERS AND DISTRIBUTORS

Place your orders now for prompt delivery for

THE GRIN VARIABLE CONDENSER



.001 M. F.

43 Plate

\$4.75

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FACTORY: SHELTON, CONN.

ATTENTION AMATEURS

A complete line of high grade radio material backed with quick service has built up a remarkable radio trade.

The Quaker Light Supply Co.

728 ARCH STREET,
PHILADELPHIA, PA.

THE N. Y. GLOBE Said

on April 15th

There is a little pocket volume now on the bookstands called "The A B C of Radio," that contains more nourishing mental food for the wireless beginner than anything that has yet come to our attention. It starts one right with a simplicity that is delightful and encouraging. It is certain to educate and is well worth buying and keeping as a handbook of ready reference. 40 cents in leatherette.

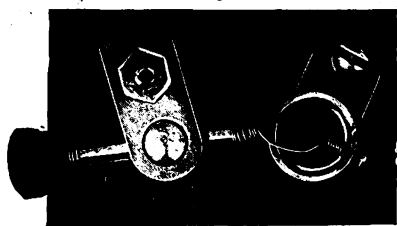
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Publisher

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LOOK

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THESE
CRYSTAL DETECTORS
Are The Very Best For Constant
Satisfactory Results.

Lowest of All in Price
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Variometers
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Variable condensers and
Cabinets

Mail orders promptly attended to
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Wireless "B" Battery**For Wireless**

No wires used in any of its construction
ENCO
Variable and Refillable
"B" BATTERY
For refills use standard flashlight unit cells,
17 cents, each
Write for Descriptive Circular
ENCO ELECTRIC NOVELTY
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603 W. 130th St., New York City

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RADIO Sets or Supplies

Visit **MODELL'S**
191 FULTON ST.
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RADIO CABINETS

Manufactured
in any Style, Size or Quantity
A. E. CHERNACK & CO., INC.
314 E. 75th St., NEW YORK
Phone Rhinelander 2747

RADIO WORLD
Is on the Newsstands
Every Wednesday
15 cents a copy

Antenna not Dangerous

One of the first questions which comes into the mind of the would-be radio user concerns lightning, says G. K. Thompson, radio superintendent of the Armad Company, in the New York "American." "Will my antenna attract lightning and cause my home to be struck?" he asks. To the general public wireless and lightning seem to be twin brothers, probably because the manifestations of both are uncanny and mysterious.

Hoisting a radio antenna over your property does not endanger your dwelling, your instruments or your family if a few simple precautions are observed.

So far as your radio installation is concerned, you should harbor no fear that it will attract lightning. You should make it a point, however, to install such safety devices as will render harmless the currents induced in your antenna by lightning striking in the neighborhood.

Shorter Words Needed

The time has arrived when the nomenclature and terminology of wireless communication should be revised and simplified, says the New York "World." For wireless or radiotelegraphy and telephony there should be substituted a single short word. Appropriate verbs meaning to send or receive such a message also should be coined. The mistakes made in coining names for other recent inventions should be avoided. The automobile was first called the "horseless carriage." "Automobile" is an unsatisfactory substitute because its length causes variation in the pronunciation, some persons placing greatest emphasis on the first syllable and others on the penult. "Aeroplane" was also an awkward word, generally mispronounced. The War Department did well to change it to "airplane." It is to be hoped that such errors will not be made in devising the terminology of wireless communication.

A Correction

Editor, **RADIO WORLD**: **RADIO WORLD**, April 1 issue, page 20, under caption "Where to Reach U. S. Radio Inspectors in Various Districts," states licenses and information can be obtained from the Radio Inspector, Room 205, Citizens Bank Building, Norfolk, Virginia.

You are advised the office at Norfolk comes under this office and all correspondence should be addressed to the Radio Inspector at Baltimore.

To avoid confusion and delay in receiving correspondence, it is requested that you make this correction in your next issue.—R. Y. CADMUS, Radio Inspector.

NOVO
"B" BATTERIES

FOR YOUR RADIO SET
All standard sizes 22½ to 105 volts.



For Sale by Leading Dealers

NOVO MFG. CO.

NEW YORK—424-438 W. 33rd St.
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Select your supplies from our complete stock of radio parts. All standard makes at popular prices.

Complete sets from
\$15.00 up

PARK ROW CYCLE
& **RADIO CO.**

29 Park Row, N. Y. C.
Opp. Post Office Basement Store

RADI-O-PLATE

The popular black composition board for panels—dielectric strength unaffected by dampness.

SIZES		
6x12x¼	\$.60
12x12x¼85
7x18x¼90
12x18x¼	1.25

Mail orders filled

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ALL SIZES ON HAND
FOR IMMEDIATE DELIVERY
WHOLESALE AND RETAIL
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RECEIVING SETS

Bought from us are installed by experts assuring you most satisfactory results.

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Expert Radio Wiring and Installations

Complete Line of Receiving Sets and
Radio Apparatus

K. R. SCHULLSTROM
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Phone Plaza 9425-9426

RADIO

THE 20th CENTURY ENTERTAINER

For the Automobilist, Motor Boat enthusiast and Camper.

Westinghouse Aeriola Sr., \$65.00
"It's a portable Regenerative Receiving Set."

Detector Tubes, \$5.00

Western Electric Head-phones, \$15.00

Radio Outfits, Supplies and parts

THOMAS J. WARD

117 West 33rd N. Y. City

Opposite Gimbel's

THE BEST PROTECTION AGAINST LIGHTNING



"JACOBUS" VACUUM

TYPE J. S. W. AERIAL PROTECTOR

This improved lightning arrester is absolutely positive, efficient protection against the heaviest lightning storms. Approved by the National Underwriters to replace lightning and ground switches. Its simplicity, easy installation and forget-proof feature recommends it especially for the amateur.

ELIMINATES SWITCHES

Receiving stations with JACOBUS Protectors do not require lightning or ground switches. Protection every minute of the day and night. No worry about throwing switches.

GOOD FOR INNUMERABLE DISCHARGE

Discharges of lightning or static on the JACOBUS do not affect its life. After conducting a discharge to the ground, the tube is ready for another operation. Does not weaken or in any way affect the efficiency of the set.

\$2.00 From Electrical Dealers Sent Direct

APEX ELECTRICAL SPECIALTY CO., Inc.
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BAKELITE PANELS

Cut to any size.

We Supply Manufacturers and Dealers. Immediate Delivery.

Any Quantity.

POSTER & CO.

58 West 39th Street

Dept. A

Phone—Fitzroy 2736



Make your own RADIO RECEIVING SET. ENJOY the concerts, market reports, latest news, etc., as sent out by large broadcasting stations. This NEW Copyright book "EFFICIENT RADIO SETS" shows how to make INEXPENSIVE set for receiving wireless broadcastings. Sent postpaid for 25c. Address J. C. Dorn, Pub., 725 S. Dearborn St., Dept. 106, Chicago.

Radio Not a Fad

WHEN we worry about where the advertisers of to-morrow are going to come from we forget that a sudden industrial or social development can produce a flock of new advertisers overnight, says "Printer's Ink." This has happened several times in the history of advertising.

The breakfast-food died out as a craze, but it left us several permanent advertisers who have made their products staple articles in our diet. The motor transport development has produced vastly more advertising in a few years than did the old buggy, in its entire career. The agricultural co-operative movement, laughed at a few years ago, has already given us several large advertisers. Brewers were large advertisers. Prohibition wiped them off the publisher's prospect list. But in their stead new advertisers in the soft drink, confection and other fields have arisen. The increase in tobacco, cigar and cigarette advertising since prohibition alone probably makes up for the advertising lost through the Eighteenth Amendment.

And now comes the radio. Just one year ago who would have dreamed that the radiophone would to-day be the subject of such widespread advertising! The merchandising attention being given to this new means of communication is perfectly astonishing. Stores are opening up whole departments devoted to it. Additional trade papers specializing in the subject are being founded. Newspapers are giving whole sections to it. Column after column of advertising of radio equipment is being run. Already the radiophone and its appurtenances are advertised articles of no mean proportions.

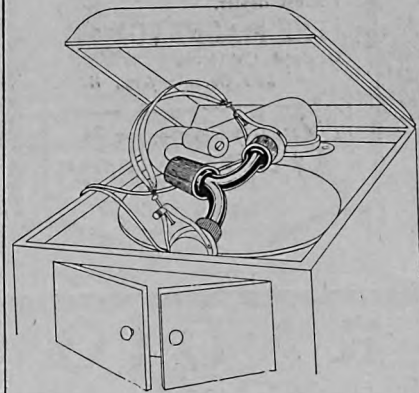
Is this just another fad that will run its day and die out? We don't think so. Railroads were not a fad. The "horseless carriage" was thought to be, but nevertheless it soon revolutionized transportation. The telegraph, the telephone, wireless, the airplane were all regarded as impractical toys, but they have established themselves as vital parts of our civilization. The radiophone will probably have the same experience.

Anyway, the radio is only a part of the electrical movement. Electricity has already given us dozens of well-advertised products. There are probably as many more waiting discovery. New uses, like the radiophone, will be harnessed to electricity. These uses and the products growing out of them will contribute amazingly to the ranks of to-morrow's advertisers.

Radio World every Wednesday. 15c a copy

PHONOTACH

Phonograph Connection
Adjust it in a minute



A new and better
LOUD SPEAKER

at a very low cost
NO DISTORTION—FULL VOLUME OF SOUND—CLEAR AND MELLOW

Send for one To-day
PRICE, ONLY, \$2.50

At your dealer or by mail

Distributor

WM. A. MILLS

103 Park Ave.,
New York.

AMATEURS

VARIOMETERS\$5
TUNING COILS\$3
SWITCH LEVERS50c.
VARIOCOUPERS\$5-\$6
VARIABLE CONDENSERS\$4-\$5
SWITCH POINTS0.30c., each
Special complete receiving outfit with phones, antennae and insulators, \$30. Mail orders filled promptly.

CLARK & TILSON

51 East 42nd Street

NEW YORK CITY

Tel. Vanderbilt 5462

BOYS DO NOT FAIL

To obtain your copy of these instructions. Worth many times the small amount we ask. How to construct a variometer, how to construct a variocoupler and an amplifying transformer. Detailed instructions of either for fifteen cents or put four dimes in an envelope and get the three with diagrams of connections for your set. Save money by constructing your own. We have left no details to guess about. We enclose list of all parts how much of each to get and where to obtain same.

Newco Radio & Electrical Supply Co.
Stratford, Conn.

VARIOCOUPLER, \$3.00

175 to 600 meter variocoupler wound and tapped; rotor and shaft in place, ready for panel. Postpaid, \$3.00. Mounted in Cabinet, \$16.00.

OLIVER YARRINGTON

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EQUIP your receiving set with the Magnavox Radio—the only reproducer constructed on electro-dynamic principle. Write for booklet and name of nearest dealer.

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Radio brings it
MAGNAVOX
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"The Popular National Radio Journal"

All that its name implies
Get a copy from your radio dealer or
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PUBLISHED BY
Pacific Radio Pub. Co., Inc.
Pacific Bldg., San Francisco

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VACUUM TUBE
**WIRELESS RADIOPHONE
AND CODE SET**

Also the Wonderful OMNIGRAPH for learning the Code, and best Theory Text Books given FREE with our Professional Home Course.

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The demand for experts exceeds supply.
Pays Big Money
Pays \$125 to 250 monthly up to \$10,000 a year or more.

Nationally recognized as foremost Wireless Institute. Wireless offers an opportunity of a lifetime to the man who is awake.



FREE LEARN-O-GRAPH code sender & Text Books. Special — Low Cost — Quick, Simple. **AMATEUR WIRELESS COURSE**, qualifying you for Amateur License.

New Stock Radiophones for immediate Delivery Call and Hear Our Wonderful Amplifier.

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RICHMOND ELECTRIC CO.

Auto, Electric and Magnet Wires, Electrical
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If you happen to have a few copies on hand, keep and display them and you will find that they will sell. Very shortly it will be impossible to get back numbers of these earlier issues.

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RADIO SUPPLIES **RADIO SUPPLIES**
We Carry a Full Line of
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Head Sets, Vacuum Tubes, Vario Couplers, Variometers, Transformers, Tuning Coils, Dials, Knobs, Bakelite Panels. Phones in stock.

Radio Sets Made to Order. Aerials put up.
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Out exactly to size and shipped within 12 hours. ¼ inch thick, \$.01½c. per square inch; 5/16 inch, .02c. Made of the highest grade black fibre. This material possesses high dielectric strength, is inexpensive, unbreakable, easy to work and takes a nice finish. Special offer 6x6¼, 50c. We pay postage.

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VARIABLE CONDENSERS

CRYSTAL DETECTORS

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THIS EDITION 70,000 COPIES—15c A COPY

RADIO WORLD

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Entered as second-class matter, March 28, 1922, at the post office at New York, New York, under the act of March 3, 1879.

MAY
SIXTH
1922

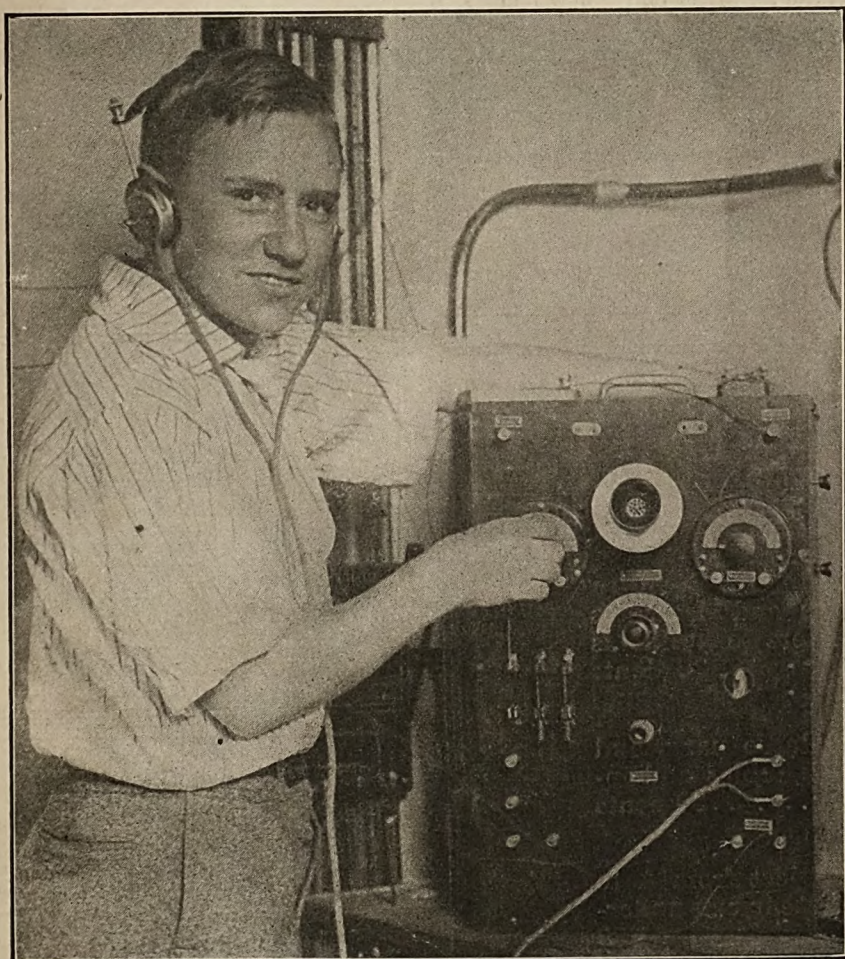
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6 mos., 3.00

3 mos., 1.50



(c. Underwood & Underwood)

On another page of this RADIO WORLD, is a photograph of the tower John Iringle built. He has one of the best-equipped amateur radio outfits in Chicago. He constructed his own plant, even the batteries, and was broadcasting long before radio became popular.



Drilling rotor with drill press in the Radio Class of the Lane High School, Chicago. (See illustrated article inside this number.)

READ "ADVANTAGES OF RADIO FREQUENCY"

TRADE MARK

URSA

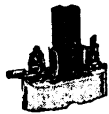
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**"JACOBUS"
VACUUM**

**TYPE J. S. W. AERIAL
PROTECTOR**

This improved lightning arrester is absolutely positive, efficient protection against the heaviest lightning storms. Approved by the National Underwriters to replace lightning and ground switches. Its simplicity, easy installation and forget-proof feature recommends it especially for the amateur.

ELIMINATES SWITCHES

Receiving stations with JACOBUS Protectors do not require lightning or ground switches. Protection every minute of the day and night. No worry about throwing switches.

**GOOD FOR INNUMERABLE
DISCHARGE**

Discharges of lightning or static on the JACOBUS do not affect its life. After conducting a discharge to the ground, the tube is ready for another operation. Does not weaken or in any way affect the efficiency of the set.

**\$2.00 From Electrical Dealers
Sent Direct**

APEX ELECTRICAL SPECIALTY CO., Inc.
77-B Orange St., Newark, N. J.

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INTERNATIONAL RADIO SHOW
—71st Regiment Armory, 34th St., and Park Ave., New York City. May 22 to 27.

BROOKLYN RADIO SHOW
—Brooklyn Ice Palace, Bedford and Atlantic Aves., Brooklyn, N. Y. Opens May 6.

MILO E. WESTBROOKE RADIO SHOW—Leiter Building, Chicago. June 25 to July 1.

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RADIOTELEPHONE is called a craze because there is no other word in the language to convey the scope and intensity of the interest that it has aroused, says the Newark, N. J., "Ledger." If it is that, it is an inspirational one with which no one can afford not to be in touch.

The very inexpensiveness of the device makes it of universal appeal.

Here is a means whereby isolation of individuals and families from operatic and other music, from lectures, from sermons, from health counsel, from technical training and from all of the greatest forces that make for education, culture and entertainment, but hitherto within the reach of comparatively few, is ended.

The railroads, steamships, telegraph, newspaper and motor car have all helped

to eliminate distance and make the earth a smaller place. But the radiotelephone goes still further in its elevating and cohesive influence. One may now sing and talk to millions. No one need be shut off from personal contact with the best the world offers.

No one had ever dreamed, in the wildest flights of fancy and longing, of such a factor for human unity, democracy, happiness and progress being made available. But, lo, here it is in our hands—the supreme miracle of an amazing age!

**have you a
broadcasting map?**

read the **RADIO RED BOOK**
25¢ 106 W. 31st ST. 25¢

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On Hand.**

"C" RADIO JACK
158 Fulton St., N. Y. C.

Manufacturers & Jobbers.

Write for prices on the new famous

Ritter

**Rotors
Variometers
Stators**

All parts made of mahogany only.

Also wood ends for tuning coils
and loose couplers.

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ENCO

"B" BATTERY

No wires used in any of its
construction

VARIABLE and REFILLABLE

For refills use standard 17c
flashlight unit cells

Enco Electric Novelty Co.
603 W. 130th ST., New York City

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Read the three interesting and instructive books by James R. Cameron, whose text books are used and indorsed by the U. S. Army, Navy, and Department of Public Instruction.

HOW TO BUILD YOUR OWN RADIO SET

Full instructions with diagrams and drawings which make it easy for beginners to build his own set. **25 cents**

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Words and terms relative to Radio parts and equipment clearly defined, with tables and information. **50 cents**

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A book that deals with the subject from A to Z—and so written that the amateur can understand it. **\$1.00**

Buy them from your dealer today or direct from

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VARIOMETERS\$5
TUNING COILS\$3
SWITCH LEVERS50c.
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Special complete receiving outfit with phones, antennae and insulators, \$30. Mail orders filled promptly.

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FREE! FREE! FREE!

Energetic boys can obtain one of our famous "Ritter Radiophone Receiving Sets" known to have received concerts at a distance of 35 miles from Broadcasting stations.

Send enclose 2c. stamp for particulars on this wonderful opportunity

RITTER RADIO CORP.
118 Walker St., New York

RADIO WORLD

[Copyright, 1922, by Radio World Co., New York, N. Y.]

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May 6, 1922

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An Editorial Written By Others

We will, this week, permit two of Radio World's patrons to furnish the text for an editorial.

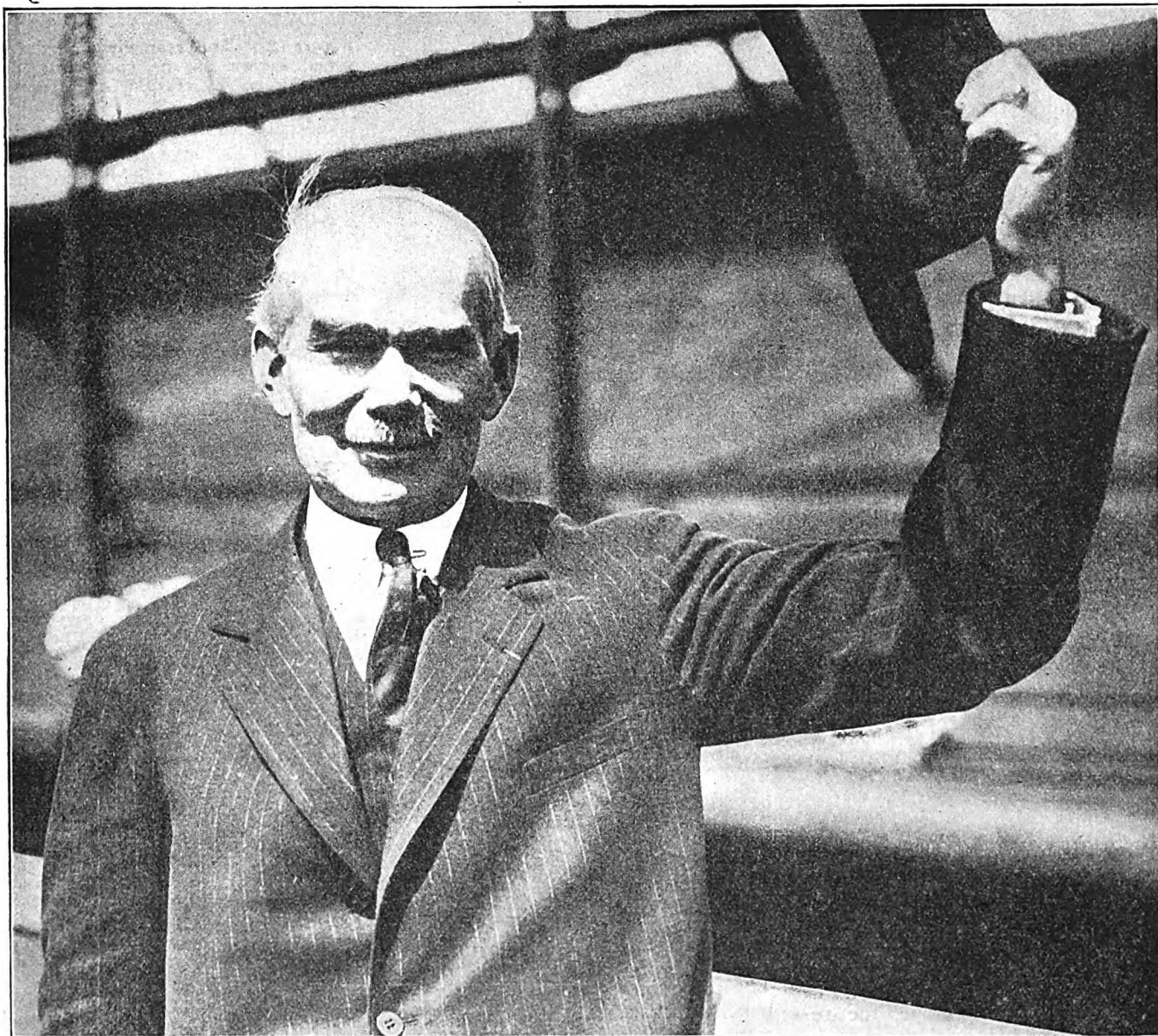
Dr. H. Riley Spitler, of Eaton, Ohio, in sending his check for \$6.00 for a year's subscription to Radio World, wrote us as follows:

"I bought a copy of Radio World at a newsstand and found it to be about the best ever. In fact, it is without a peer in the field of radio publications."

Mr. J. C. Hornstein, general manager, Howell Cine Equipment Company, Inc., 729 Seventh Avenue, New York City, has written us as follows:

"We wish to state we have received over five hundred inquiries within the last few days, from the half-page advertisement which we put in your Radio World, issue of April 15, 1922."

These words are more eloquent to us than anything our contributors or editors could write.



(Photograph from Wide World Photos)

Arrived from Europe Friday, sailed again Tuesday! Lee De Forest, wizard of wireless, bidding good-by to America as he departed for Germany to perfect his radio and talking motion-picture inventions.

T T F A
+

The Advantages of Radio Frequency

By Harold S. Potter

RADIO-FREQUENCY amplification seems to be the great hobby of most amateurs to-day. Let us consider the advantage of radio-frequency over audio-frequency amplification. First of all, radio-frequency amplifiers, if well built, are quiet in operation. There are no tube noises to speak of. In an audio-frequency amplifier, the first tube is a soft detector tube, given to hissing when near the critical point. This hissing is then greatly amplified if a two- or three-step amplifier is used, and will seriously hinder the reception of weak signals. This trouble does not enter into radio-frequency amplifiers, since the detector is the last tube, and its local noises are not amplified.

A radio-frequency amplifier cannot be used to amplify loud signals, as only a slight amplification would be obtained; but signals so weak as not to be audible on a detector alone may be greatly amplified. This property of a radio-frequency amplifier is very useful in receiving weak signals of about the same wave-length as strong ones. Static, also, is but slightly amplified.

A greater number of steps of radio frequency can be used than is possible with the audio-frequency type of amplification. There is less "howling."

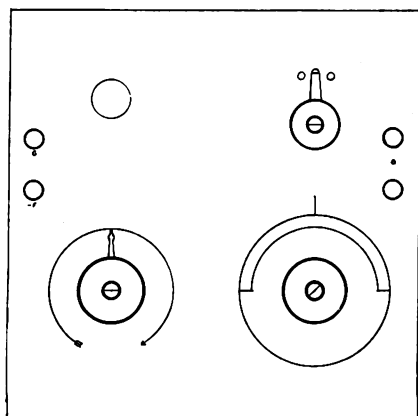


Figure 1. The front panel which serves to show just what the completed set looks like when completed. Drawn by Harold S. Potter.

There are several types of radio-frequency amplifiers in use to-day, such as the resistance-coupled type, the transformer-coupled type, in which iron-core or air-core transformers may be used, and the tuned-plate circuit type.

The first-mentioned type, the resistance-coupled, is efficient only on wave lengths of over one thousand meters, while the second type uses

special transformers which cannot be readily constructed by the amateur; so we have only the tuned-plate type left for short-wave work. This variety of radio-frequency amplifier is the best where but one or two steps are to be used; but is impractical for a greater number of steps, due to the fact that each step must be carefully tuned to resonance with the incoming signals. The great advantages of this type is due to the fact that great regeneration is obtainable and very selective tuning may be accomplished.

Step for step, a tuned radio-frequency amplifier should cost less than an audio-frequency amplifier. Each

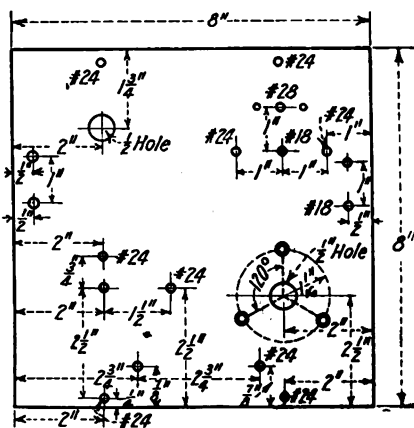


Figure 2. This diagram will be of value to the amateur in showing how the panel should be drilled. Suggested by Harold S. Potter. Drawn by S. Newman.

requires a tube, socket, rheostat, and a .0005 mfd. Murdock condenser, will cost less than a good audio-frequency transformer.

Either A-P amplifier-tubes, or Meyers tubes, will give good results in a radio-frequency outfit; but radio-trons should not be used, since they possess a very high capacity between their elements.

Having mentioned a few of the important points in regard to radio-frequency amplifiers, we are now ready to take up the construction of an instrument. The set I am about to describe is of the tuned-plate type, and has a range of approximately 150-800 meters, which is quite sufficient for use with the ordinary short wave regenerative sets on the market to-day. The drawing, Figure 1, of the front panel, will serve to show what the completed set looks like, while the other drawings, Figures 2, 3, 4, 5, and 6, show the details of construction.

1. Panel

The panel is of 3/16 of an inch black bakelite, 8x8 inches. The drawing of the panel layout, Figure 2, shows how the panel should be drilled.

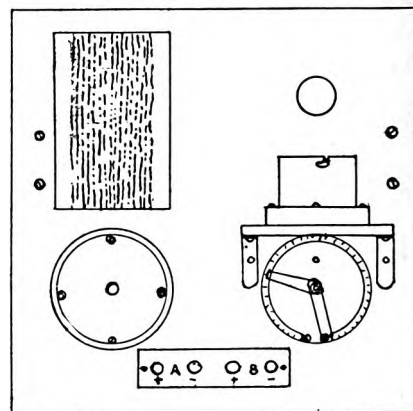


Figure 3. The rear view of the sub-panel, known as the connecting panel. Drawn by Harold S. Potter.

The size drill to use is shown beside the hole. A large hole, 1/2 inch to 1 inch in diameter is drilled for an audion window.

The sizes and arrangement of holes for mounting the condenser are shown in the diagram. A 1/2-inch hole is drilled for the center shaft, in order to provide sufficient clearance. Great care should be observed in laying out and drilling the holes for mounting.

Referring to Figure 3, a small sub-panel, or connection panel, will be noticed on the back of the main panel near the bottom. This panel is of 1/8 inch or 3/16 inch black bakelite, 3/4x3 inches. Four small binding-posts are mounted upon it, to take the A and B battery connections.

In the end views, Figures 5 and 6, it will be noticed that the panel is supported by a base board of 3/8-inch hardwood, 8x5 1/2 inches by 2 3/4-inch round-head brass screws fasten the panel firmly to this base, which is entirely independent of the bottom of the cabinet, and slides into the cabinet. In this way, the amplifier may be used without the cabinet to support the panel.

2. Condenser

The variable tuning-condenser is a Murdock, No. 3680, is of the panel-mounting type, has 23 plates, and a capacity of .0005 mfd., maximum. It is mounted at the lower right-hand corner of the panel. The Murdock condensers are 3 5/8 inches in diameter at the longest part—the top plate. The height of this type is 1 5/8 inches. If the builder so desires, a different

make of condenser may be used; but this will require a different arrangement of the mounting holes. The Murdock condensers will give complete satisfaction if used, and are especially desirable because of their small size and light weight.

3. Inductance

Great care should be exercised in the winding of the inductance if good results are expected. Although I have conservatively rated the range of this

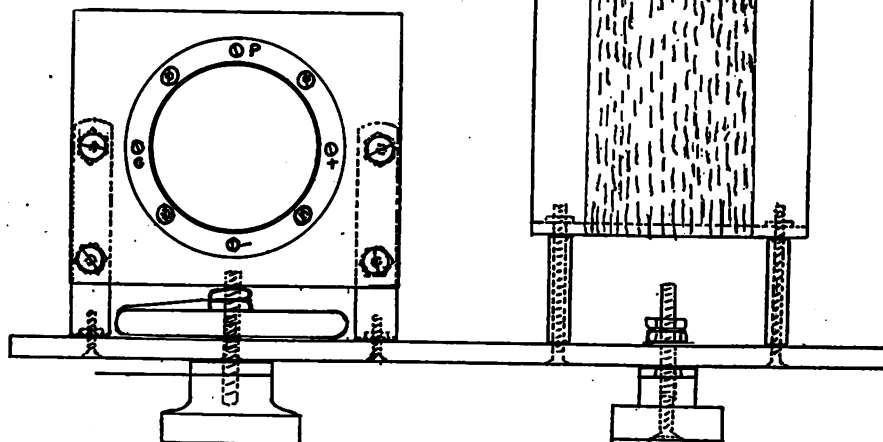


Figure 4. This drawing gives the builder the proper idea of mounting. It shows the top view. Drawn by Harold S. Potter.

amplifier as 180-800 meters, it will be noticed, from the following data, that the range is somewhat broader, thus allowing for possible errors.

The data for the construction of this inductance was taken from the pamphlet, "Inductance Tables," by M. B. Sleeper. The coil is 1.45 inches long, and is wound on a 2.5-inch length of fibre tubing, 3½ inches in diameter, leaving about a ½-inch margin at each end to allow for mounting. No. 24 single silk-covered wire is used. The data for tapping the coil is as follows:

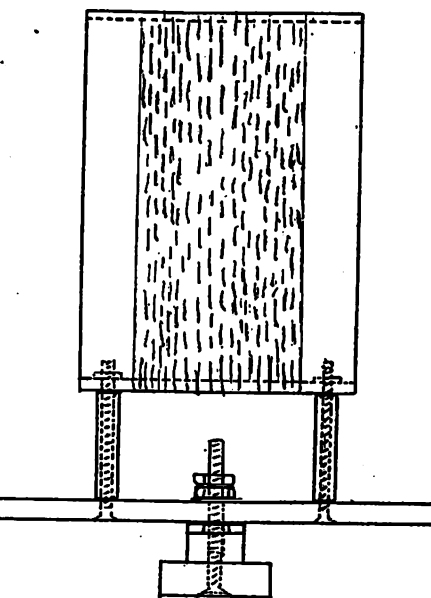
	Distance in inches from start	Turns	L in Omo.	X with .0001 Cond.	X with .0005 Cond.
1st Tap	.5	21	70,560	158	354
2nd Tap	.85	36	165,800	243	542
End	1.45	63	370,400	362	811

The taps are removed at the points noted in the above data, and connected to the contact points of the three point switch on the panel, directly in front of the inductance. It will be noted that the ranges of the various sections overlap, and it is well to bear in mind that, in tuning to a given wave length, the best results are obtained by using a high value of inductance, and a low value of capacity.

For example, in tuning to a 300 meter station, better results are obtained by placing the switch block on point 2, and putting a small capacity in the circuit, than by placing the switch blade on point 1 and using a comparatively high capacity.

At this point, I will say a word concerning the mounting of the induct-

ance. Figure 3 shows its location, while Figures 4 and 5 show the details of mounting. At a distance of ¼ of an inch from each end, and on the same side of the tube, two holes are drilled through the tube. These holes will then be two inches apart,



and will match the holes drilled in the panel for the purpose of mounting this inductance. Two 1½ inch No. 6-32 flat-head brass machine-screws, with nuts to fit, are used to support the inductance. Two 1-inch lengths of brass tubing with an inside diameter of 5/32 of an inch are used, as shown in the Figures before mentioned, to give a space of one inch between the panel and the inductance.

4. Rheostat

The rheostat may be of any make, but the drawings show a Rembler, the type I used in my model. It is, of course, the small-size Rembler. This rheostat is about 2 and 3/16 of an inch in diameter, has a No. 8-32 threaded-brass shaft, and a 1½ inch knob, with a 1¼-inch pointer. The resistance is 6 ohms, quite sufficient for use with any of the modern tubes.

The rheostat is mounted at the lower left corner of the panel, directly under the tube base.

5. Tube Base

The tube base may be of any kind designed for the modern four-prong tubes. Care, however, should be taken to select one which has the four-contact springs at right angles, thus cutting down the capacity effect between the springs. I used a De Forest base with good results.

The tube base is mounted on a shelf made of ⅛-inch bakelite, hard rubber or hardwood, 2½x3 inches, which is, in turn, secured to the panel by two

brass bakelite having two-inch legs. This shelf is mounted above the rheostat, and 3½ inches from the bottom of the panel. It will be noticed, also, that a space of ½ an inch is left between the front of the shelf and the panel. This is to allow for the tap of the rheostat, which projects up slightly, between the brackets.

6. Connection Panel

The connection panel, previously mentioned, is mounted behind the main panel as shown in Figures 3, 5, 6, while the drawing of the panel shows the holes are drilled.

No. 6-32 flat-head brass machine screws are used to support the sub-panel, and a couple of old battery-nuts are used to space it about a ¼ of an inch from the panel.

Four binding posts, of almost any type, are mounted on this panel. These binding posts are used for connecting the A and B batteries, thus eliminating a great bunch of unsightly wires on the front of the panel.

7. Panel Fittings

Having discussed the essential parts of the amplifier, we now come to the panel fittings which might be termed the trimmings. In my model, I used an Amrad knob and 3-inch, 180-degree metal dial. These knobs and dials are made for a ¼-inch shaft, and a set screw is provided in the knob.

The rheostat uses the regular Rembler knob, which comes with it.

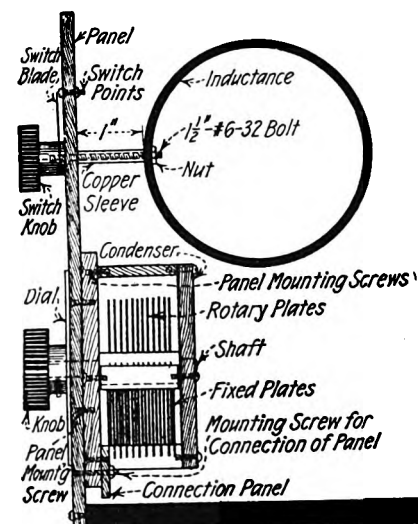


Figure 5. Detail of various parts of the panel showing side right hand view. Suggested by Harold S. Potter. Drawn by S. Newman.

The top switch is of the common type now on the market. It has a 1-inch nickel-plated blade, and a bakelite knob 1 inch in diameter. Small nickel-plated switch points are used.

The four binding-posts mounted on the panel are of the molded-composition type about ⅜ inch in diameter.

The builder should remember that
(Continued on next page)

(Continued from preceding page)
articles such as knobs, dials, and binding posts need not be of exactly the specified type; but may be selected to harmonize with other apparatus on the table; as, for example, the composition-binding posts could just as well be replaced by brass or nickel-plated ones, or a bakelite dial used instead of the metal one. Such changes would necessitate no change in the design or in the panel layout.

8. Cabinet

The completed set is protected by a cabinet of $\frac{1}{4}$ -inch quartered oak, with inside dimensions of $8 \times 8 \times 5\frac{3}{4}$ inches. Four $\frac{1}{4}$ -inch holes are drilled in the

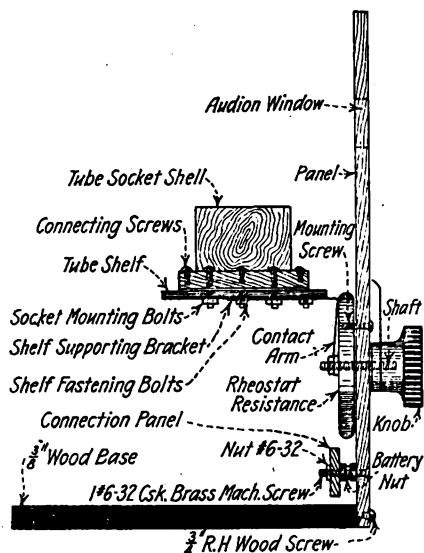


Figure 6. This clearly describes each little part of the sub-panel which carries the tube socket and rheostat. Suggested by Harold S. Potter. Drawn by S. Newman.

back of the cabinet, and the wires from the batteries are passed through them in order to reach and connect with the connection panel.

A strip of $\frac{1}{2}$ -inch oak, 1 inch wide, is fastened to the underside of the top, $\frac{3}{16}$ of an inch from, and parallel with, the front edge. After the panel—secured to its base—has been set in place, two $\frac{3}{4}$ -inch round-head brass wood-screws are passed through the holes near the upper edge of the panel and screwed into the above mentioned strip, holding the panel firmly in place.

By this method of mounting, the panel and base may be easily and quickly removed from the cabinet and used without it.

The cabinet may be finished up in any finish desired. I used one coat of dark oak stain, one coat of varnish, and then rubbed it down with crude oil and powdered pumice.

9. Hook-Up

No. 14 B and S-gauge bare copper wire should be used in making con-

nections, if good results are to be obtained. In working with currents of radio-frequency, it is absolutely necessary to have all wires as short as possible, and parallel wires as far apart as possible. Wires should cross at right angles, or nearly right angles. All connections should be soldered, using some non-corrosive soldering paste.

Figure 7 shows how the amplifier is hooked up. The first drawing shows in detail the connections of the differ-

ent instruments on the amplifier panel, the second shows its connection to a detector, using the same A and B batteries.

In this case a B battery of about 45 volts is used, a tap being taken off at 22 volts for the detector.

When the same A and B batteries are used, as shown, the lower output-post need not be connected, as the dotted lines show. Better results are obtained by using a different A and B battery for the amplifier and detector.

In this case the lower output-post should be connected to the common filament post of the detector.

Conclusion

It should be remembered that the plate-circuit of the amplifier must be tuned to resonance with the station to be received, or no signals will be heard.

Probably the best way to secure results with this type of instrument is to celebrate the amplifier against a standard wavemeter, making a record of the switch and condenser-settings for different wave-lengths. Then, to tune for a certain station of known wave-length, set the condenser and switch in the proper position, and tune the station in on the tuner in the usual way. If the tuner is already calibrated, the process of tuning above described may be reversed and the amplifier may be calibrated from the tuner.

If a station of unknown wave-length is sufficiently loud to be heard on the detector alone, it may be tuned in on the detector and then the amplifier connected. A double pole, double throw switch may be arranged to connect the tuner to either the detector alone, or to the amplifier and detector.

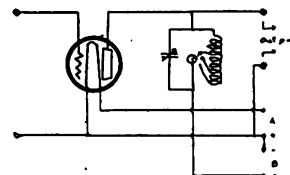


Figure 7. Circuit with amplifier hook-up.

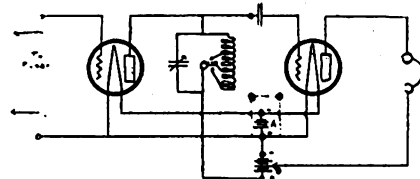
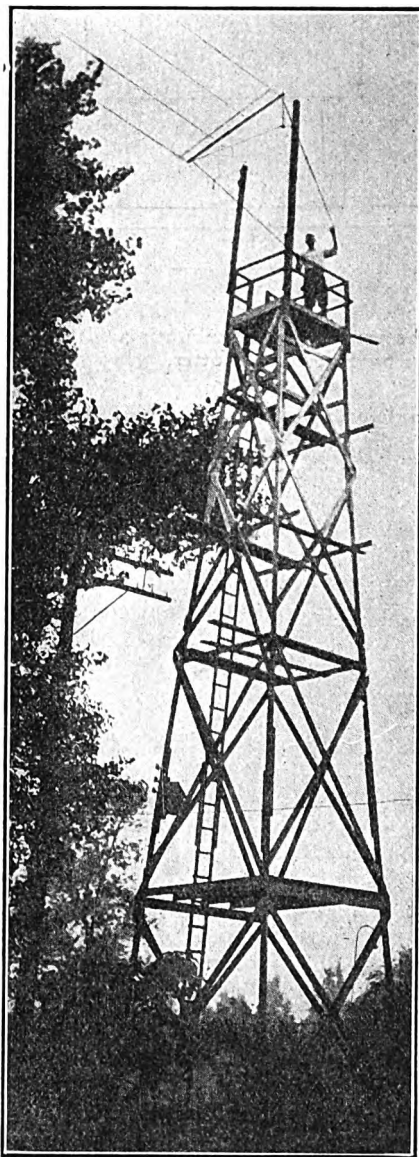


Figure 8. Circuit using amplifier with necessary connections to detector circuit. Drawn by Harold S. Potter.

As this type of amplifier gives very selective tuning on the plate coil, a somewhat less selective tuner may be used than would otherwise be practical, and satisfactory results may be obtained on single-coil tuning outfits.

A Boy's Aerial

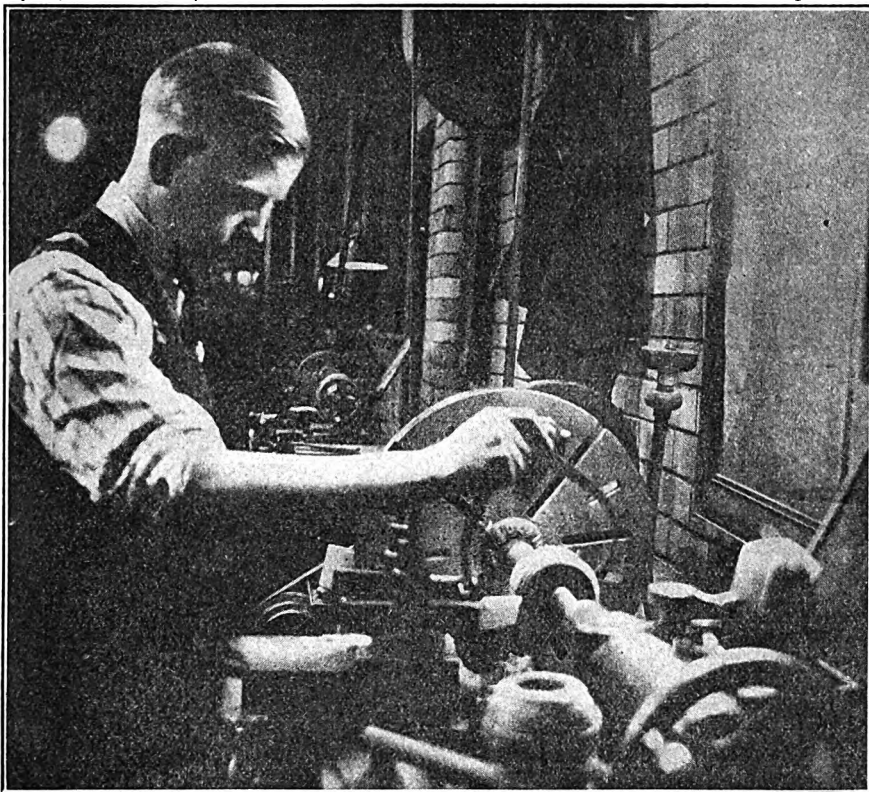


(c. Underwood & Underwood)

John Iringle, fourteen years old, a pupil at the Tilden High School, Chicago, has one of the best-equipped radio stations in the second city of the United States. He has constructed most of his radio equipment even down to the storage batteries. Long before the present radio craze swept the country, he was giving his friends very selective operatic concerts. The photograph shows the 60-foot radio tower, with his four-wire aerials, which be erected with aid of his radio chums.

Chicago High School Teaches Radio

By George F. Paul



Facing off end of rotor for required diameter

AT the Lane Technical High School, Chicago, boys are kept busy, as a part of their regular school work, in making various parts of radio sets. Regular instruction in the operation of wireless sets and in the sending of messages also has become part of the school's course.

The boys like this work. It is intensely interesting. They take to it as the proverbial duck takes to water. There is a keen rivalry among the leaders to see which will be able to first turn out a certain part or to attain a certain speed in the handling of messages. The training is practical; this is indicated by the fact that the star quarterback on the football team has served as wireless operator on one of the big lake steamers.

In the classroom instruction, boards with keys and phones attached are used. Six boys can receive training while using one board. They learn the Morse International Code. They are given training both in sending and receiving messages. Boys are grouped according to the speed they show. This means that, in one group, may be found boys who can copy from five to 10 words a minute; in a second group will be those who can copy from ten to fifteen words a minute.

in a third group will be other boys who work at greater speed. In the classroom, the boys are taught the theory of wireless, and many informal discussions are held to make clear the fundamental principles.

The boys in the radio classes are assigned to duty in the cage which is installed on the ground floor of the school building. This station, GDB is in operation throughout the school day and while the boys are on duty. There is a regular operator and one assistant every period of the day. The regular operator is a boy who has obtained his license as an amateur. This

Winding a rotor and fitting in stators in the radio class of the Lane High School, Chicago, Illinois. The first public school to create a course in the popular marvel.

instruction is under the personal direction of Miss Helen Bergner, who enjoys the distinction of being the only licensed woman operator in the city of Chicago. She is probably the only woman teacher of radio in any large high school in the United States.

One of the most interesting features of the work at Lane is that the different shops are co-operating in making parts for wireless outfits. The school principal, William J. Bogan, has received many orders for these parts, and in turning them out it has been found necessary and also advantageous to divide the work into class projects. This gives boys in different years some training in this new subject and arouses their lasting and growing interest in wireless.

Thus in the woodshop some of the younger boys are kept busy making cabinets to hold the receiving sets; also cabinets for the amplifiers. In the pattern shop, another group of boys are working on the form for the variometers and the variocouplers. Special machines have been made for turning out some of the parts so as to insure greater accuracy.

In the electric shop, the boys are winding and wiring variometers and also assembling the sets as the parts become available. They are also doing some of the engraving on the sets.

The radio club at Lane gives the boys a chance to pick up a lot of valuable hints on wireless installation and operation. The president of the club is George Frost.

Recently, at one of their meetings, the boys had a competitive "spell-down" to determine the best-informed members of the club. Each contestant asked his opponent a set number of radio questions. The contest proved that the boys are keenly interested.



Using Radio to Fight Forest Fires

By Harry Gould

DUE to the carelessness of man, many thousands of dollars worth of valuable timber is wasted every year by forest fires. To overcome this frightful waste, Congress created the United States Forest Service, not only to protect the forest, but to prosecute all persons who are the direct cause of these gigantic losses.

Every means of communication to locate the fires was utilized—telephoning, heliographing, wigwagging and other methods of signaling; but, three years ago, radio was given a chance.

A combination of radio and airplanes was planned by the officers of the Forest Service and the United States Army Air Service. Airplanes were put in service to fly over forests and locate any fires that were seen. In order to facilitate the work, receiving stations were installed at the forest headquarters.

The planes were equipped with $\frac{1}{8}$ -kilowatt, 500-cycle spark transmitters, consisting of generator and exciter—driven by a small propeller—a transformer, a mica condenser and inductance, all mounted on the running-gear of the plane. The only equipment inside the plane was a key and a radiation ammeter.

The antenna is a single-strand wire with a lead weight (known as a "fish") attached to one end. The "fish" keeps the antenna from becoming tangled with the control wires and gives a vertical component to the antenna in order to overcome a purely directional effect of radiation. When the "ship" is ready to make a landing, the antenna is wound up on a reel located in the rear of the observer's seat.

All fire messages are sent by code in order to save time. A few minutes may mean much in checking a conflagration. The official code is as follows:

Coda

Fire call: FFF:

New or old fire: N-New. O-Old.

Location: T-Township. R-Range. S-Section and subdivision.

S-Size: G-Single snag. M-Camp fire. R-Square rods. A-Acres. T-Timber. B-Brush. O-Open. X-Burn or cut over.

S-Slope: L-Level. G-Gentle. S-Steep.

W-Wind (Velocity and direction): N-North. S-South. E-East. W-West.

New Frequency Amplifier Brings Faintest Waves In Strong

By George W. May, R.E.

RADIO-FREQUENCY amplifiers are now attracting considerable attention. This is due undoubtedly to the arrival in the market of a radio-frequency intervalve-transformer which incorporates many new and important features.

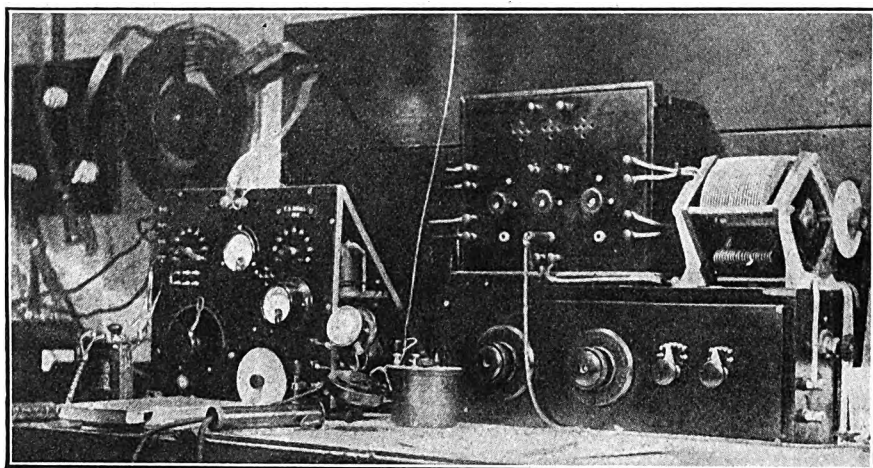
Heretofore, radio-frequency amplifiers operating on short-wave lengths have not been very satisfactory, and transformer-coupled radio-frequency circuits, even if satisfactory on short waves, could not be extended to cover medium or long-wave ranges without the addition of separate transformers. Where an operator desired to cover a band of wave lengths from 150 to 5,000 meters, it was necessary, therefore, to employ three or four different transformers. In a cascade amplifier employing three stages, twelve transformers were required to function over the band of wave lengths indicated.

The radio-frequency amplifier now being marketed, is designed to function satisfactorily over a range of from 200 to 5,000 meters. The windings of both the primary and secondary coils are provided with a tap so that each winding has three terminals for connecting the transformer for different wave-length ranges. Where operation is desired on from 200 to 5,000 meters, a small metal-strip is used to connect two of the terminals of each winding, thus short-circuiting the long-wave portions. Where operation is desired over a range up to 5,000 meters, this strip is disconnected and the full windings are used.

The very broad-wave length of this new transformer is only possible because a laminated iron-core is used. These laminations are extremely thin, and each piece of metal in the core is thoroughly insulated from its neighbor by a process of japanning. On short waves, the frequency of the incoming signals is so great that penetration of the core is negligible. As the frequency decreases with the longer waves, penetration of the core is greater, having the effect of increasing the inductance value of the windings. This action permits the transformer to function properly over a band of wave lengths that were previously unattainable.

Undoubtedly this improvement in the wave-length range of radio-frequency circuits will make them more popular. Reports are already being circulated of extremely long-distances being covered regularly by amateur receiving-stations.

Home-Made Long Distance Receiver



(c. Kadel & Herbert News Service, N. Y.)

The receiving set of the radio station shown in the accompanying photograph, constitutes a regenerative circuit with a detector and two-step amplifier. It proved a success when demonstrated by its builder, B. B. Duvall, of Baltimore. Mr. Duvall claims that he heard the United States Navy Station at Avalon, Catalina Island, California, approximately three thousand miles away, broadcasting a concert. To the left of the receiving equipment is the transmitter, which, with the aid of the other transmitter on the table, a voice may be broadcasted through the radio transmitter to thousands of listeners. The transmitter on the left may be used for either voice modulation, straight continuous wave, or interrupted continuous wave.

Broadcasting on Bedloe's Island

ONE of the best-equipped broadcasters in the United States is the radio station on Bedloe's Island in New York Harbor, where stands the Statue of Liberty. It is operated by the United States Army, Lieutenant H. S. Paddock in charge. This station is familiar to hundreds of radioists by its call letters, WVP. It was opened about eight weeks ago for general broadcasting on a wave length of 1,450 meters—one that is particularly free and clear and that permits of very little "jamming."

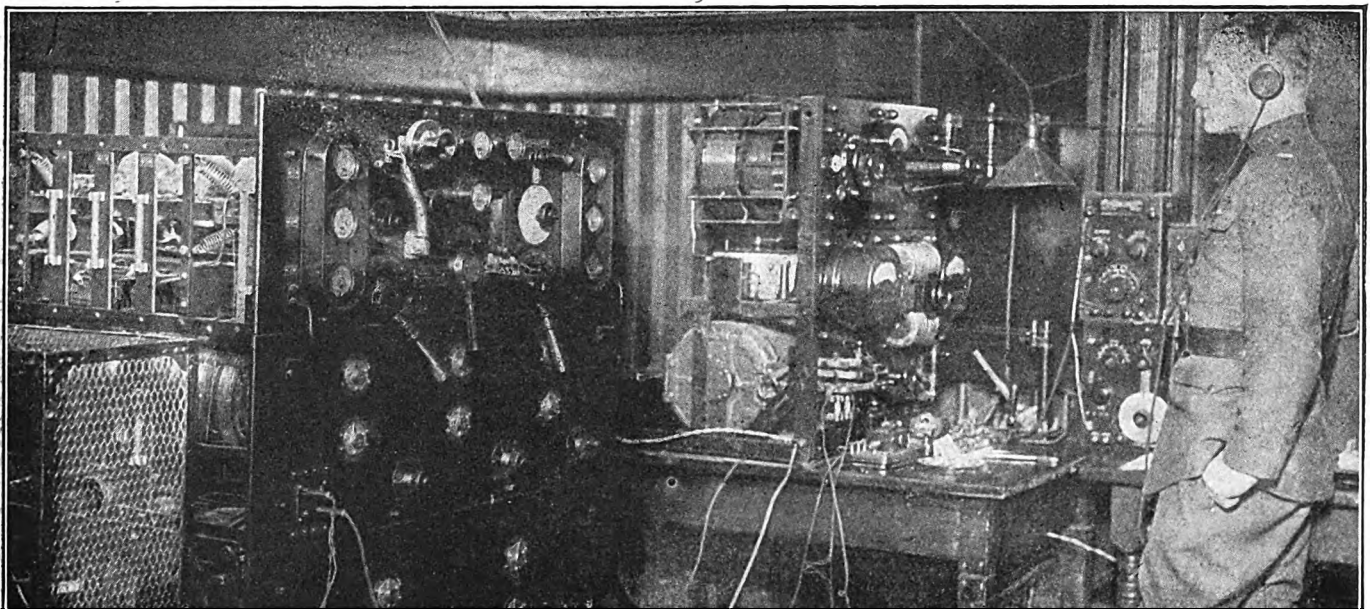
The photographs give one a splendid idea of the important characteristics of an up-to-date station. At the left of the photograph at the bottom of the page, is the large transmitter which sends music and the human voice on their long journey. Note particularly the mouthpiece on the panel with its many switches and meters which indicate the various wave lengths and the degree to which the matter being transmitted is modulated.

The station on Bedloe's Island has every possible modern device and is one of the best in the government service.

In the photograph to the right, Lieutenant H. S. Paddock, Post Signal Officer, U. S. A., is explaining to Miss Margaret Walz, Philadelphia's first policewoman, the mysteries of the "soup plate." In polite radioese, a "soup plate" is a transmitter used in broadcasting. The photograph across the bottom of the page shows the interior of the United States Army broadcasting station—WVP—at Bedloe's Island, New York Harbor, Lieutenant Paddock is the officer in charge.



(Photographs copyrighted by Keystone View Co., N. Y.)



Radio World's Hall of Fame



HAROLD J. POWER

Declared by many to be the pioneer of broadcasting. His realization of the universal importance of radio broadcasting led to the establishment of the world's first station in 1921—the big station operated by the American Radio and Research Corporation at Medford Hillside, Mass. Mr. Power experimented for a year, when a boy, first in his mother's kitchen and later in a shack he called a laboratory, before he received from the Boston Navy Yard his initial message over the crude instruments he had constructed.

Harold J. Power

Established a Daily Broadcasting Station in 1921, after Years of Struggle

By George H. Flint

HAROLD J. POWER, of Medford Hillside, Massachusetts, was one of the first men to realize the universal importance of radio. And this realization led to the establishment of the world's first broadcasting station in 1921. He probably deserves the title of "Pioneer Broadcaster."

Mr. Power first became interested in radio during a certain half hour in a grammar school, back in 1904, while he was struggling through his writing lesson, endeavoring to add genuine Spencerian touches to his chirography. He was then in his eighteenth year. Across the top of the copy book was a sample specimen of handwriting for the pupils to copy. The sentence read: "Marconi, the inventor of the wireless telegraph." It became riveted on young Power's mind. The name "Marconi," and the word "wireless" danced before him as if imbued by magic. Electricity had attracted Harold Power since he was a boy. He was familiar then with the use of batteries and simple apparatus. He thought that if he could send a wireless message across the back yard of his home he would accomplish something really wonderful.

Finally, he determined to accomplish this feat. He tried to find out how to make a wireless set. At that time—eighteen years ago—no books had been published in the United States on the subject. The only material available were a few short articles that had appeared in the scientific magazines.

The first outfit of Harold Power consisted of simple metal-filing coherer with a relay and the telegraph sounder. He put up the set in his mother's kitchen. He reconstructed an old soap box into a table. Then he attached a little post to his mother's clothespole in the yard, with the wires running down from it.

One year later, he received his first message. However, he had determined that he would have struggled for that message if it had taken fifty years. Many times he was discouraged, but his mother spurred him on to succeed.

Mr. Power received his first message from the Boston Navy Yard, situated about five miles from his mother's home. That was the hap-

piest day of his life, he says. He managed to catch about one-fourth of the message—about three or four lines. His instruments did not work consistently.

The message came through early one morning. Harold Power rushed to his grandmother's room and made her jump out of bed to hear the marvelous sounds. He was so thrilled that he rushed into the homes of several of his neighbors and aroused them. Their only comment was to call him a fool.

Gradually the young man improved his equipment, as new improvements were made. In 1909, when the American battleships returned from their historic trip around the world, his equipment was fairly well perfected and his little station was one of the first to pick up the information of the incoming ships a thousand miles out at sea. The operator at the Boston Navy Yard was surprised when he learned that the message had been received. It was difficult to convince him that a wireless message had come over a thousand miles.

In the spring of 1909, Harold Power was listening in one morning and heard the steamship "Harvard" calling to the Boston Navy Yard. The Navy Yard station was not operating, or the operator was not on watch, for the ship received no response. She had many important messages and was anchored down the harbor in a heavy fog. Power called the "Harvard" and offered to deliver the message to the local office in Everett and despatch them. The outcome of this was that the company owning the equipment on the "Harvard" offered him a position the following summer as commercial operator on the steamer "Yale," plying between Boston and New York. He was then sixteen years old.

Through the effort of the Reverend G. G. Hamilton, he entered Tuft's College on a Scholarship. Before he could finish his course, the donor of scholarship died and the young man's plans had to be abandoned. His dreams of a scholarship went a-glimmering, but as he had spent two years preparing for college, with characteristic pluck, he decided to go anyway. Not only would it be necessary for him to pay his college expenses, but he also had to help out at home. The

best way to earn a nest-egg in a short time, he reasoned, would be to teach. And he decided the only subject he could teach was wireless.

When he went to the physics teacher in the local high school and told him he would like to start a class of wireless telephony at the evening school, the teacher was interested and brought it before the committee. The members only laughed and said it was presumptuous of this boy to think he could teach working boys, who lacked even a high school education, to operate a radio set. They turned him down, but he went back. "Give me a room in the high school building and establish a class as a regular course in evening school," he urged. "I agree to teach for one year without salary unless one of my students qualifies for a position as a commercial radio operator."

The Evening School committee probably agreed, because they thought they would never have to pay him that salary. Discussing this, Mr. Power says:

"Never will I forget the first night the class met. There were about thirty students enrolled, every one of them old enough to have been my father. I was very timid. When I got up before that class of men to start instruction in radio telegraphy, I lost my voice. My knees didn't bother me, but my voice just went completely. Yet I knew I had to make good. I had to have that position, so I forced myself to continue. I worked hard that year, because I found out I knew very little about radio myself. It was the most valuable experience of my life, because it taught me to study."

Needless to say, that school committee had to pay him a salary. Two students qualified as operators after the first term.

The next fall he entered Tufts College with \$30 and a lot of courage. Three days later he had barely \$5 left, and had not purchased all the books. He saved car fare by walking to Everett, six miles away. His term bill came due. It was \$75 plus a lot of extras. He decided that he would pay that bill. On the same day he received a notice from the Evening School committee that he had been appointed a regular teacher on the school staff at \$2 an evening for three three evenings, which was \$6 a week.

Broadcasting at WJZ

How They Sing and Talk into the Transmitter at Newark

By Golda M. Goldman

MR. AND MRS. Listener-in allow me to present the man-behind-the-voice, Announcer A. C. N., of the Newark Westinghouse Station, WJZ. In real life, he is Mr. Thomas Cowan—a pleasant young man of medium height, with curly blond hair. After the police sergeant at the door of the Westinghouse factory had passed me on to another policeman on the stairs, I was greeted by the original announcer himself. The agreeable voice sounded strangely familiar, so I felt at home at once.

The reception room is not at all romantic; it is, in fact, merely the general office of the Westinghouse Company, and, at night, notwithstanding the lights and the ever-present police, it has a queerly deserted look. As Mr. Cowan and I were getting acquainted, the performers for the evening arrived—Mr. Charles B. Isaacson and a group of artists who were to give the evening's entertainment. The group included Signor Renato Zanelli, baritone of the Metropolitan Opera; John Meldrum, a blind pianist; Miss Margarite White, soprano, and Miss Alice Clausen, pianist.

Before being taken into the studio, we were shown the most interesting exhibit in the office—a large map of the United States, thickly dotted with red and green pins. These pins represent the places from which letters have been received from listeners-in who have been entertained by the WJZ concerts. Recently the great antennas on the roof were raised to a greater height. The red pins represent letters received before this was done; the green are those received later. As the improvement was in clearness rather than in carrying power; there are no green beyond the red. To my amazement, I saw pins in San Diego, California; Seattle, Washington; Cuba; Panama, and north almost to faraway Labrador. Near the chart, Mr. Cowan pointed out a letter.

"That," he said, "is from a naval officer whose ship was only two hundred miles off the coast of France when he wrote it."

We entered the studio, where the entertainments are broadcasted. I thrilled in anticipation, expecting to see a place of sumptuous proportions and exquisite furnishings. What I did see was a long, very narrow room,

with bare white-washed walls, and a quantity of old office furniture. In one corner stood a grand piano. Along the wall was a pianola; opposite were two victrolas. Above the piano, striking an incongruous note, was an oil painting of a Spanish lady in a black mantilla.

"That," Mr. Cowan told me later, "is my own. I brought it from my own home when I wanted to transform the place into a proper setting for the opera 'Thais' one night, when Mme. Namara, of the Chicago Opera Company, sang here."

Near the grand piano Miss Florence Smith Vincent was talking slowly and distinctly into a black box which stood at just the proper height, upheld by a nickel tripod. Such an innocent-looking object is the famous microphone—the means of transmitting sound to millions of people at once. As nearly as I can describe it, it looks like an ordinary receiver multiplied, perhaps, a dozen times. I had looked for a large and elaborate mechanism for transmission—I found a little black box!

When Miss Vincent finished her animal stories, Mr. Isaacson's concert began. The radio instrument is so very sensitive to every sound that no one can speak in the room while the switch is open, so we all maintained an unearthly silence, and scarcely dared breathe. First, Mr. Meldrum played a Beethoven composition and I thought that, perhaps, this blind pianist who played so feelingly, would be in closer touch to the unseen multitudes who were listening than any of those who were to follow him. Mr. Zanelli then sang the *Largo al factotum* from "The Barber of Seville," and followed it with a spirited Spanish-dance number.

I Am Radio

By George Schubel

INSTANT messenger of sympathy and love

Servant of parted friend,
Consoler of the lonely,
Bond of the scattered,
Enlarger of the common life.

Carrier of news and knowledge,
Broadcaster of Happiness and Truth,
Instrument of trade and industry,
Promoter of better understanding,
And of peace and good will among men.

Then Mr. Isaacson read his "Face to Face with Beethoven." In the midst of this, one of the special police beckoned me out of the room, and invited me to go up and see the radio office on the roof. Up we climbed to a little office ablaze with light, where I found Mr. O. G. N.

"Oh, I said, 'I'm so glad to meet you. I have heard you speak over the phone so many times. We can hardly tell your voice from that of your brother.'"

"My brother?" said Mr. O. G. N., looking puzzled.

"Well I suppose it's your brother, as the last initial is the same and your voices are almost identical. He calls himself 'Announcer O. H. N.'"

"I see," said O. G. N., laughing. "I guess most people make the same mistake. The first letter, A or O, means announcer or operator; the final means Newark, and the middle initial stands for the speaker's last name. I'm 'Announcer O. G. N.,' which, translated, means 'Operator Guy, of Newark.' An operator is a man who not only announces, but understands this mechanism up here as well. When you are called announcer, you just introduce the entertainers."

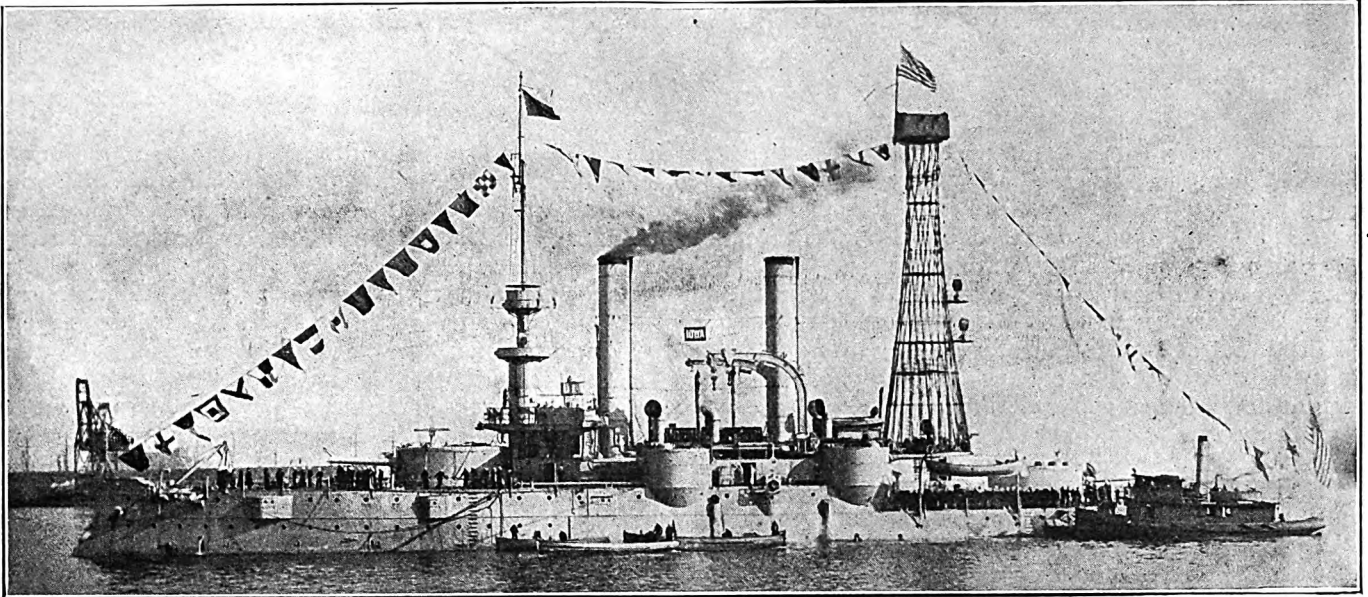
He then let me listen over his receiving set, which can easily be regulated in loudness. "I can make that so loud," he said, "that it would burn out the phones."

He touched a switch. Suddenly an object on the table which looked like a round electric-heater with an asbestos back, began to sing! This is called a phonotron. It can be regulated so that its sound will fill a large hall. The effect is quite like that of a victrola, except that it is, of course, very much clearer, as that mechanical sound is entirely absent. One of these in every home would have the advantage of always providing the latest music. And its versatility! One could tune it down soft and low to croon the baby to sleep, or put the little folks in a circle on the floor while the Man-in-the-Moon tells them their bed-time story; or let it out and start the folks dancing! No end to its possibilities.

"And here," said Mr. Guy, "is the famous and so-called mysterious, black box."

He handed me a box about the size

Radio-Equipped "Iowa" to Be Sunk



(c. International)

Radio will play a very important part when the famous battleship "Iowa," once pride of the American Navy, will face the mighty guns of the Great Atlantic Fleet only to be sunk. The "Iowa" is completely fitted with radio control that makes it possible for her to be controlled from another vessel without having a man aboard. If one remembers, last fall, this vessel was under constant radio control from the Naval radio experimental ship, "Ohio," while airplanes hovered overhead in order to test various types of bombs. Some 600 changes were made by radio and the "Iowa" responded to every move that the commander of the Ohio made. Next month when the "Iowa" steams past the Delaware Capes for the last time, she will be sent in a hunt-and-chase-game by radio only to be found by the Atlantic Fleet and sunk by the fire of the huge dreadnoughts.

(Continued from preceding page)

of a large cigar box with one receiver. No wires were attached for either ground or aerial. He told me to take it out on the roof.

Of all the uncanny experiences! Out on the roof, above the lights of the town, with the two great antennas of the wireless station stretching upward, one hundred and twenty-five feet, like giant masts, I held this little unattached box in my hand, put the receiver to my ear, and heard Miss White, who was several floors below me, finish the "Slumber Song." It gave me the most indescribably strange sensation. Can you fancy the day when we will all carry something of the sort around with us?

I finally tore myself away from the roof, and returned to the studio. Miss Clausen was at the piano, accompanying Miss White. I had not previously noticed a little receiving set which was in the room. I put on the phones, and heard "The Dance," by Rossini, come back into the room which they had barely left. They had been up in the air and returned again!

Then the Isaacson concert was over. The genial Mr. Isaacson, the spontaneous, bubbling Zanelli, and the other entertainers departed in a laughing crowd. Mr. Cowan settled down to telling me the history of the broadcasting movement.

This work began, last October, with the broadcasting of the World's Series, at the Polo Grounds, New York, in the daytime, and victrola concerts at night. From that it has assumed the present elaborate proportions. Mr. Cowan, who used to be in charge of the welfare work and entertainments for the Westinghouse Company, is responsible for the concert work in Newark. He bears the proud title of "the original WJZ."

"We've just started," said Announcer A. C. N. "This will be the greatest thing in the world in a few years. We'll give you complete operas and plays!" He became enthusiastic. "We'll have a really fine studio, large and well furnished." He went on to give me a glimpse into the way in which he intends to bring the finest things in the artistic world, not into the theatre, but into our homes. It is a wonderful vision and, as he handles it, a fine ideal.

When I could think of no further excuse for lingering in that fascinating atmosphere, I started for home. When I reached my own library, thrilled to the finger-tips by my close-up of radio, I was still in time to hear over my own set the conclusion of Major Vivian Gilbert's lecture on "The Romance of the last Crusade with Allenby in Palestine."

Sailor's Regard for Radio

Every seafaring man believes that radio belongs to the sailor, claims Lieutenant Commander D. C. Patterson, district communication superintendent of the United States Navy.

"He has good cause for this belief, too," says Lieut. Patterson. "It's practically the only means of communication he has."

"Our greatest service is rendered to the mariner. He receives not only news, both general and personal, but weather forecasts, chronometer time and reports of danger in his path at sea. Letters come in daily from all the seven seas telling how the naval radio has helped guide some ship."

"Before the recent radio convention in Washington was called, the director of naval communication requested my views. I told him we suffered absolutely no interference from the amateurs or broadcasting stations."

Heard 5,000 Miles

A twelve-tube receiving set with a one-meter loop antenna, in Paris, France, has been used in recent radio experiments. Experts have found that, with this instrument, they could detect low power transmission up to 5,000 miles away, under ordinary conditions. Besides detecting and amplifying, the tubes have succeeded in filtering out a great deal of static and other worries.

How to Construct, Protect, and Operate a Storage Battery

By George W. May, R. E.

THE storage battery—these cells of electrical energy are of vast importance. All wireless or receiving outfits, now on the market, equipped with a vacuum tube, require two batteries, technically known in the trade as the A battery and the B battery. The A battery is a storage battery of relatively low voltage and high amperage, while the B is just the opposite.

First of all, we shall endeavor to outline the construction of a storage battery, the plates of which are constructed chiefly of lead. The plates are generally cast and the pores are filled with oxides whose component parts are varied, thus producing what is known as a positive and the other a negative plate.

The plates are made in various sizes, depending upon the capacity called for; capacity, in turn, being figured as to the size of the plates, area of plates, and number or group of plates assembled. When a cell is ready for assembly, an even number of plates are connected to a strap preferably burnt on, and of an uneven number, attached in the same manner to another strap. There is always one more negative than positive, this being necessary to keep all surfaces active at all times.

Now that we have the plates assembled, we will endeavor to interleave them; but when this is to take place, we must provide some means for preventing the plates from touching each other. This is accomplished by placing some insulator between each plate, the purpose of which is to prevent the plates from being short-circuited which, in time, would probably kill the battery.

Experiments with rubber, mica, and glass were made, but experts found out that a very good wood separator was far better than any of the above mentioned separators. It has been noticed under experimentation that when batteries were assembled with different insulators and placed on test, the one containing the wood insulator showed up far better than insulators previously mentioned.

In one examination of hard-rubber insulators, we found that, with a jarring of the battery, small pieces would break off, or, in fact, break up and have a tendency to fall downward be-

tween the plates. It is evident that with these hard-rubber bits falling down, portions of loose active material would be carried out of the pockets or grids; and, probably, by the time they worked their way to the bottom of the cell would loosen and rip other portions of the cell. This does not so happen with wood as the acid soaks the wood to such a degree that, being of a wet nature, bits that do drop are so small they rarely carry any active material with them. Should a poor quality wood be obtained and used in the construction of the battery, the user will find that, for filament lighting howling noises will be experienced. Most radio folks blame this on the receiver—preferably the tubes—whereas the cause is the battery which has possibly passed its stage of perfect operation.

The mere fact that your filaments are burning to a great brilliancy, and signals are received, does not indicate that you have a good battery. A question that is very often asked by the newcomer in the game of radio is, "Will an automobile storage-battery do for radio work?" Evidently the answer is "Yes;—but there are several other features of the case that may make a difference."

There are storage batteries especially designed for radio apparatus that have characteristics which differ from the storage battery manufactured for automobiles, telephones, and other special work. An automobile battery is made up with very thin plates and separators in order to enable the battery to give a very high rate of discharge for a short time. This of course is necessary when the battery is used for starting the automobile. In the automobile the battery is constantly being recharged and will hardly ever be left fully discharged as a radio battery is. Thin plates and separators are satisfactory for such service, but when the battery is allowed to stand discharged, time after time, the requirements call for heavy plates and separators.

In radio work, the discharge rate is very slow and the heavy thick plate gives a steady voltage, which is much to be gained in radio work. The thin plate battery may fluctuate considerably with the consequent change of signal strength. Each type of battery

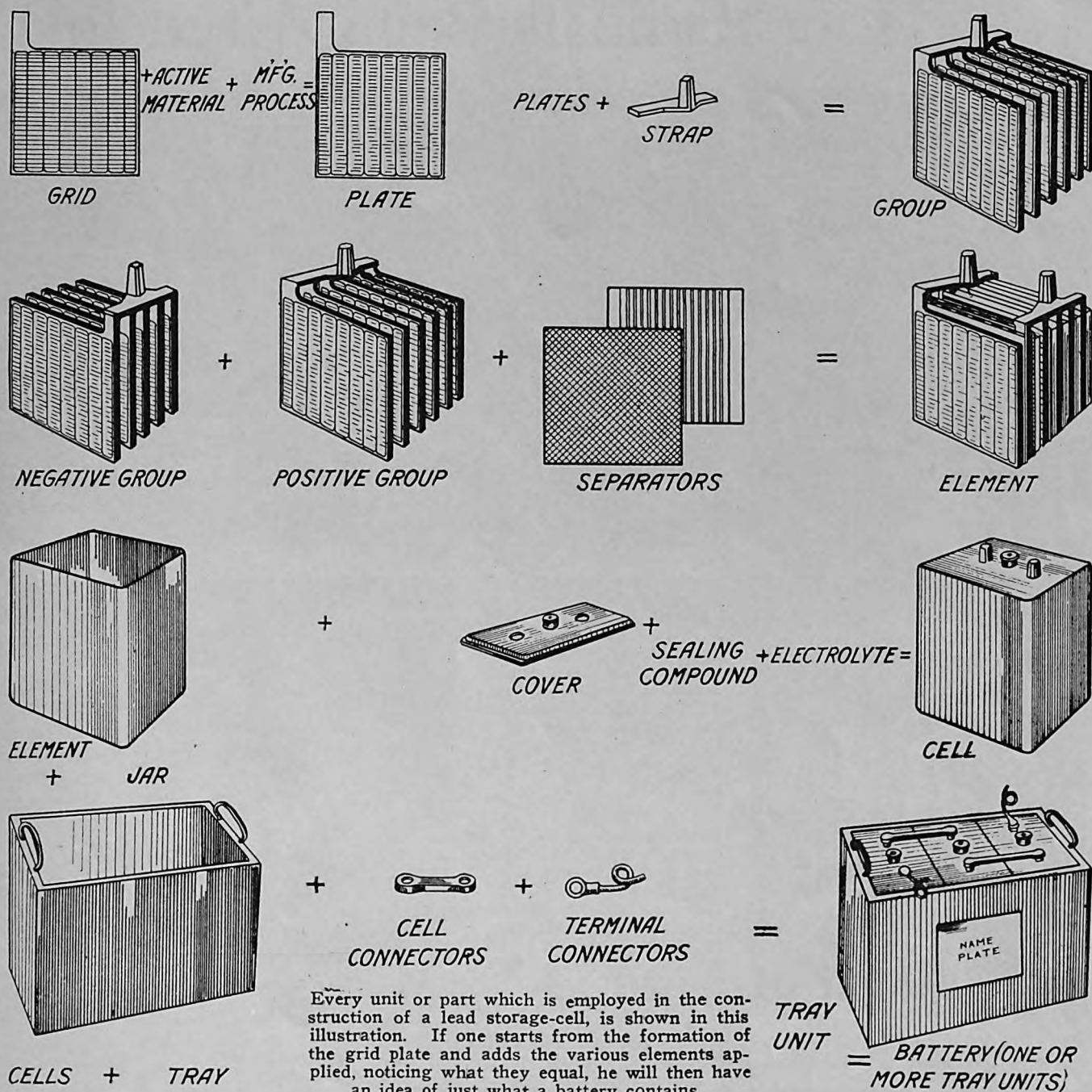
is built for a certain type of work, and while the automobile battery may be used for radio work it would not prove economical or efficient.

Many of the so-called radio stores that have sprung up recently, are selling storage batteries to beginners. Many of these storekeepers have no extensive knowledge of electricity and will place a battery, for a test, with the prospective customer. With a heavy piece of wire, they will cross or short the terminals and, of course, a hot spark is secured. This test means nothing, and is the worst punishment a battery can have.

Another idea; many batteries are sold at bargain-counter prices for radio work. I call your attention to this so as to be sure and consider before purchasing a higher-priced article at a low figure. It is a sure sign that there is some reason for such a sale. Be careful of rebuilt wartime batteries, as they are merely batteries whose positive plates and insulators have been replaced and the old negative plates used. There is no question that these batteries will operate perfectly in automobiles; but for radio work, where a steady voltage is required, the result will not be obtained, causing an annoyance in the functioning of your receiver. It is better to pay more and get a new article.

Storage batteries are rated in volts and ampere-hours. The radio battery should never exceed six volts as the vacuum tubes are built for this voltage. If an eight-volt battery is used, the tubes will either burn out immediately or will be very short-lived. The ampere-hour rating means that the battery will deliver one ampere for as many hours as stated. Thus a forty-ampere hour battery will deliver one ampere for forty hours. Naturally the higher the ampere-hour rating the longer the battery will go without recharging.

But there is another important factor to be taken into consideration. The higher the rating of the battery the more it will weigh and if the battery has to be taken out to be charged, the user will find that it may take two men and an auto to get the battery to the charging station. A small-size battery of, say, forty-ampere-hour capacity may be used, and in this case it may be good to have two batteries,



so that when one is being charged the other may be used. These batteries weigh only about thirty pounds and may be transported easily by hand.

The most efficient way to use the storage battery is to have a good rectifier at home and charge your own battery as it gets low. The rectifiers may be purchased for a reasonable sum and the amateur who owns one is, indeed, lucky. With the charger, it simply means that a large capacity battery may be installed because it won't have to be moved; and, about every third or fourth night, the battery may be left on charge all night. Thus it will be seen that there will never be a shut down of the radio set owing to the discharged condition of the battery. This is, by far, the best way to use a battery as it will be kept charged up and in good condition.

The only sure test for the storage battery is the hydrometer test. This instrument may be purchased for a very reasonable sum and it consists of a glass tube with a rubber bulb at one end. Inside the glass tube, is a small float. The end of the tube is placed in the liquid inside the battery and the bulb pressed. This will exclude the air, and when the bulb is released, cause the liquid to flow up inside the tube. The inside float will then rise with the liquid. The man who is doing the testing then looks at the little float to see what the reading is. On close inspection, it will be seen that the float is divided into small divisions ranging from 1,100 to 1300. If the battery is fully charged, the hydrometer will read 1280; if it is discharged, it will read 1225. The battery should not be allowed to stand when the

reading shows 1,200. Sometimes the battery will show an overcharge. This condition is about as bad as the discharged condition, and readings should be taken frequently to see that the battery is in good condition.

A storage battery is a rather delicate affair, even if it does weigh a lot, and care must be taken to see that it does not deteriorate quickly. With good care, a battery for radio work should last for several years. The liquid inside the battery is composed of sulphuric acid and distilled water. This counteracts the acid and makes it harmless. Occasionally the liquid in the battery will get low. In this case, never add acid but simply add enough pure distilled water to cover the plates.

The four disadvantages of a lead type battery are mechanical weakness, buckling, sulphation, and short life.

Ways for Usefulness and Pleasure

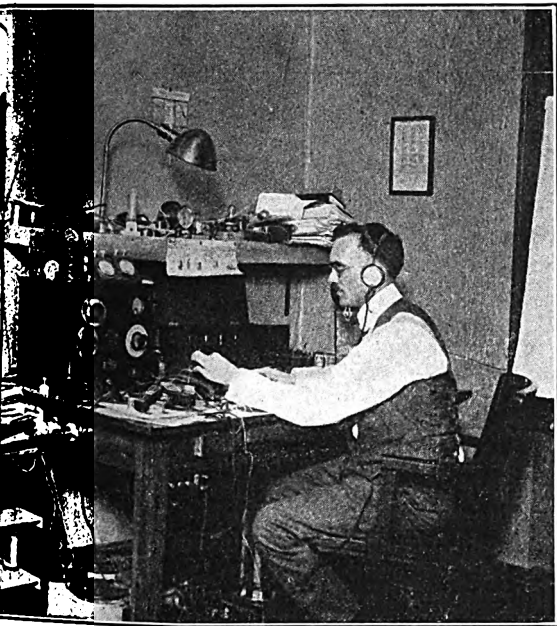
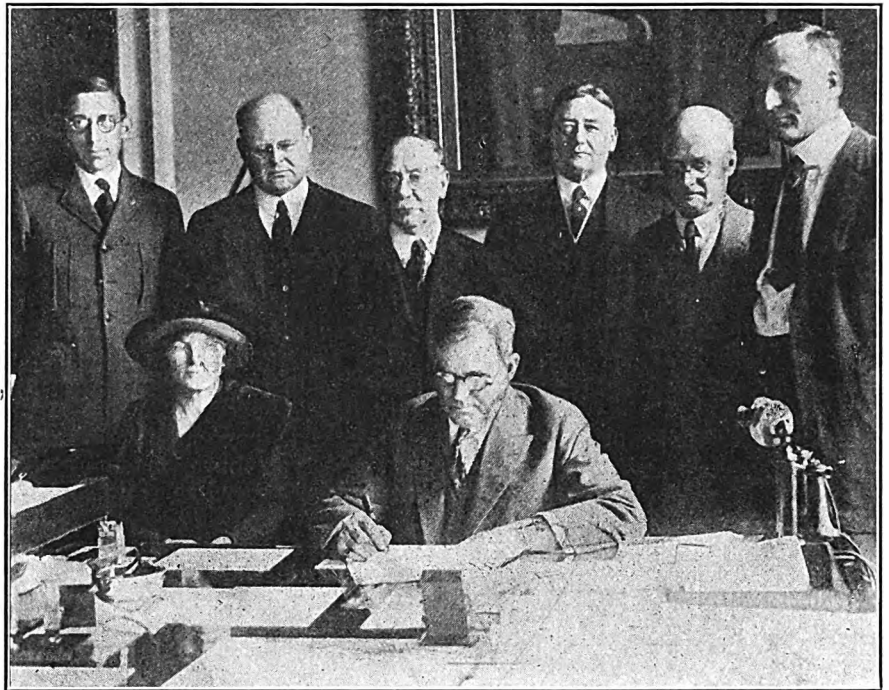


(Left) Reading from left to right—Frank Urson, Mat Moore, Marshall Neilan, George Dromgold, Raymond Griffith and Beatrice Joy in a moving-picture studio spending an idle hour listening in.

(c. Underwood & Underwood)

(Right) No human voice ever went so far as that of Secretary Wallace, of the Department of Agriculture, when he radioed his Arbor Day speech. Experts claim that his voice was heard at one time by more people than any other person's voice since the world began.

(c. Underwood & Underwood)



of the enthusiastic radio fans of Washington. He went—but the other tenants claim that it makes too much noise. There should be an easy way to quell such a disadvantage—the photograph shows that Mr. Cook has a pretty complete outfit.

(c. Underwood & Underwood)



The radio receiving-set on the Pioneer Limited, the fast train on the Chicago, Milwaukee & St. Paul. Passengers in the club car photographed listening in while a concert is coming over the ether. The Pioneer is one of the fastest trains in the United States.

(c. Underwood & Underwood)

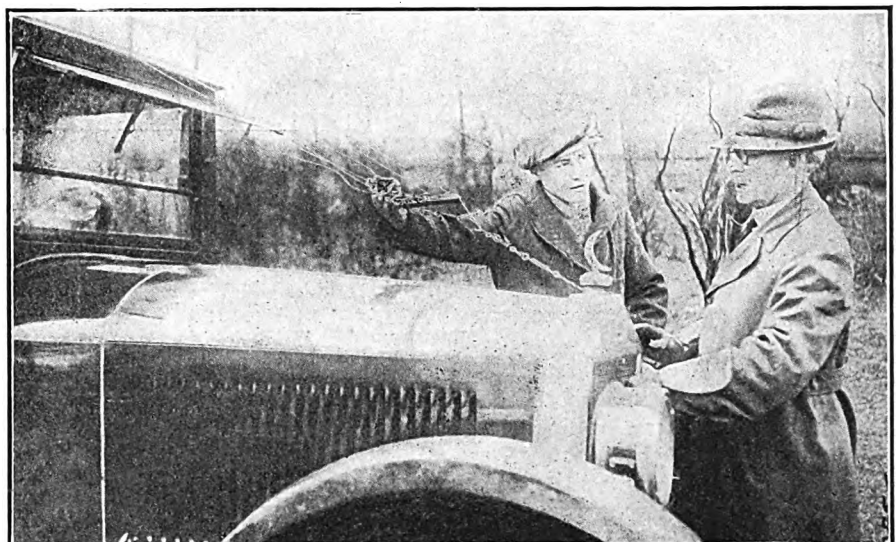


(Left) A corner in the Turn Verin dining room, Brooklyn, N. Y., where radio has been installed for the benefit of the club members. This is the first club to use radio in this way. A loud speaker is connected up with the receiving set.

(c. Underwood & Underwood)

(Right) a Chicago physician has rigged up his motor-car for radio reception. His aerial is strung from the radiator shell over the top of his coupe to the tire rack in the rear. The doctor can receive messages when he stops and makes a grounding.

(c. International)



The Radio Primer

A. B. C. of Radio for the Beginner Who Must Have all Primary Facts Put Plainly and Accurately, and all Terms Fully Explained

The Beginner's Catechism

By Edward Linwood

AFTER the waves have passed through tuning coils and variable condenser, what do they next affect?

In simple set, the detector.

What is a detector?

A detector is a device which is placed in a wireless-telephone receiving-circuit to intercept the waves as they rush through and so alter them that they can be heard through a pair of telephone receivers.

Why is this necessary?

Because the waves as they pass through the air are too rapid for our ear to catch and for our brain to report. Radio waves, when they leave the broadcasting station, travel nearly 830,000 a second. Our ears were never made for radio reception; therefore, detectors are fashioned for waves moving at the rate of 10,000 a second, or less. Our ears are made to pick up speech, and speech is seldom carried by sound waves at a speed greater than 8,000 a second. There is a big difference between 12,000—the limit of the human ear—the 830,000 of the radio waves. If it were not for the detector, we would never be able to listen to broadcasting, even though the waves were passing around and through us continually.

What is there about a detector that gives it this wonderful power?

To answer this question it will be necessary to divide the detectors into two classes, the vacuum-tube detector and the crystal detector.

The crystal detector is the simpler and the older of the two. It was with a crystal detector that many of the early distance-records were made. It consists of a certain piece of crystalline metal suspended in a cup in such a way that a fine spring-wire can be swung around onto it at any point. It is the contact between the fine wire and the crystal that provides the detector action.

What crystals are used?

Among others, carborundum, silicon, galena, molybdenum, radiocite, chalcophyrite, bornite, and zincite. The first five are used alone with the fine wire. The other three are used in pairs—one crystal bearing on the other.

Why can these crystals change the speed of the radio waves?

Because of a peculiar property which they have of letting only part of an electric current pass through them. As you have read in "The Primer," in preceding numbers of

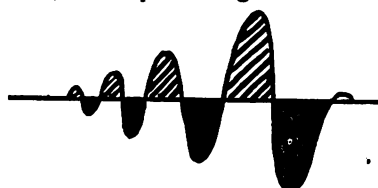


Figure 1. Diagram of radio wave as it passes around through tuning coil and condenser. Solid-black part represents positive wave; cross sectioned part, the negative wave.

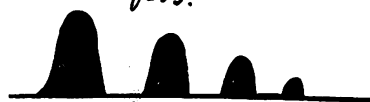
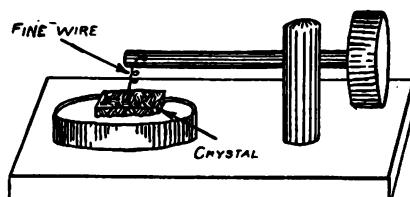


Figure 2. After passing through detector, wave of Figure 1 has been reduced to this form. The negative wave has been strained out by the crystal.



Simple crystal-detector. The fine wire bears on a sensitive spot on the crystal.

RADIO WORLD, all radio waves, when they pass through the air, are in the form of a wave, one-half of which is traveling in a positive direction while the other half is traveling in a negative direction. This is illustrated in Figure 1. Now a crystal of one of the substances mentioned above has a fondness for the positive kind of elec-

tricity, but won't have anything whatsoever to do with the negative kind. The crystal opens wide its door to the waves that are positive, but the door is slammed in the face of the other waves. This exclusiveness of the crystal is a fortunate thing for us. If the radio waves are trotting around our receiving circuit at a tremendous speed and we insert a detector in their path just one-half of all the waves

Wouldn't the frequency of the waves, that is, the number of times they occur a second, be still too much for the ear?

That is quite right, but the story is only half told. Suppose we started with a spark, or a transmitter, which sent out 800,000 waves a second. By eliminating half of them, we have cut down the number we must account for, to 400,000. This is still forty times faster than the ear can appreciate. So we come to an instrument called the telephone. And in order to make the entire action clear, the phone will be described before we have completed the detector.

However, as the two devices really work together they should be described in the same way.

What is a head phone?

A radio head-phone consists of a twin pair of pieces of soft iron about half-an-inch high, a quarter-of-an-inch broad and, perhaps, a sixteenth-of-an-inch thick, around which are wound hundreds and hundreds of turns of very fine silk or enamel-covered copper wire.

The end of the wire from one of the little coils is then connected to the beginning of the second coil.

What is an electromagnet?

An electromagnet is a piece of soft iron around which a large number of turns are wound; the wires from the latter being connected to a supply of electricity. The term, "electromagnet," is used to distinguish this type from so-called "permanent magnets." Electromagnets do not produce magnetism until the current passes through the turns of wire, while permanent magnets, as their name implies, retain their magnetism imbedded in the steel or iron out of which they are made.

But my phones have magnetism even when they are disconnected. Why is that?

That is done intentionally. The iron centers of the magnets are a combina-

The Radio Primer has been published regularly in RADIO WORLD since issue No. 1, and will be a regular department in order to instruct and aid the many thousands of amateurs who are joining the ranks of radio enthusiasts every week.

The Radio Primer (*Continued*)

Tuning and What Is Meant By It

AS described in this installment of this article, published in RADIO WORLD, No. 5, the receiving antenna must be altered in some way so that its wave length is equivalent to that of the station sending the message. This is the reason for *tuning*.

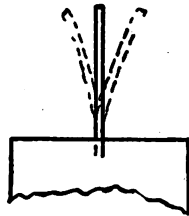
There are, in reality, three ways of doing this: By changing the length of the receiving antenna system; by adding inductance; by adding capacity. Most amateurs, of course, are not equipped to change the length of their aerials to accommodate various wavelengths, hence one or both of the other methods must be used.

The tuning coil in any of its forms, such as the one- or two-slide tuner, the loose coupler, the variocouples and the variometer is a device for adding inductance to the antenna. The variable condenser stands alone as the device for adding capacity to the receiving station.

If an aerial does not contain sufficient inductance for a given wavelength inductance can be added in the simplest manner by inserting a coil of wire consisting of several turns of wire wound around an insulating tube. The phone and detector will be placed in series with this coil. By series, we mean that the wire from the aerial is connected first to one end of the coil and that the other end of the coil is connected to the detector. From the other binding post of the detector the wire leads to the phones and from the phones to the ground.

But this arrangement, while simple, is very inefficient because of the extraordinary resistance which has been in-

serted in the aerial circuit by the detector and phones. A high resistance in a radio circuit carrying the high-frequency currents of a radio message means that the electric impulses will



A spring set in vibration will move from side to side until the friction of the air brings it to a stop. If the spring is vibrated in a liquid it will come to a stop sooner. The decrease is similar to "damping."

be killed down too rapidly. The situation can be easily pictured in this way: Suppose that a steel spring is held in a vise, as shown in the illustration. The unsupported end is snapped back and released. The spring will swing from one side to the other too fast for the eye to follow, and, gradually, due to the resistance and friction of the air, it will slow down and come to rest. Now, if the same spring is made to vibrate in a liquid, such as water, it will move from one side to the other, but due to the heavier resistance of the water, it will come to rest much sooner than in air. When a resistance in the form of a detector or phones is inserted in a high-frequency circuit, the effect is the same as when the spring was vibrated in water. The energy is lost in heat, and the impulse comes to a rest sooner than it should for good reception. A wave, under these conditions, is said to be *damped*.

Realizing the faults of this simple circuit, it is evident that the inductance must be added to the same amount but

in such a way that the phones and detector can be added to the circuit without increasing to such a great extent the wasteful resistance. In practice, this mode of tuning is accomplished by means of a double coil or transformer, called in radio parlance, a "loose coupler."

With a loose coupler, the proper amount of inductance is added to the circuit by increasing or decreasing the number of primary turns used. The primary coil is the outside coil. When this has been done the antenna circuit is said to be *tuned*. But the antenna circuit contains no detector or phones or means for picking up the sounds. This is achieved by inserting the outer coil, a second coil of wire called the *secondary*. There is no connection between the two coils. But when an electric current flows around through the turns of the outer coil each turn is surrounded by areas of magnetism. If the secondary is then brought relatively near the first coil, the magnetism will cause little currents to start in the secondary and instantly there is a full current in the inside coil corresponding to that of the outside coil. If the current in the outside or primary is varying at the rate of 100,000 a second, then the current in the inside coil is imitating it at the same rate.

The primary has already been tuned to the incoming radio-wave. To make the station complete, the secondary circuit must now be tuned to accommodate the same wave, then both primary and secondary will vibrate in unison. When this has been accomplished the set is said to be *tuned*.

In tuning the secondary, we are again confronted with the necessity of supplying inductance and capacity in the desired amounts. The secondary coil, of course, supplies the inductance. It also supplies some of the capacity, because there is a miniature condenser between each two turns of wire. Between each wire connecting the various parts of the receiving set and the ground, there is another condenser. But these condensers are fixed. Their capacity is a certain amount and is not easily changed. So to provide a sensitive change in capacity, a variable condenser is inserted in the circuit.

If the condenser and coil are considered at length, they will be more easily understood especially as regards their relation to fine tuning.

A continuation of this article on tuning, will be published in next week's issue of RADIO WORLD.

(Continued from preceding page)

tion of permanent and electromagnets for a reason which will be described and explained later.

What are the other parts of a phone?

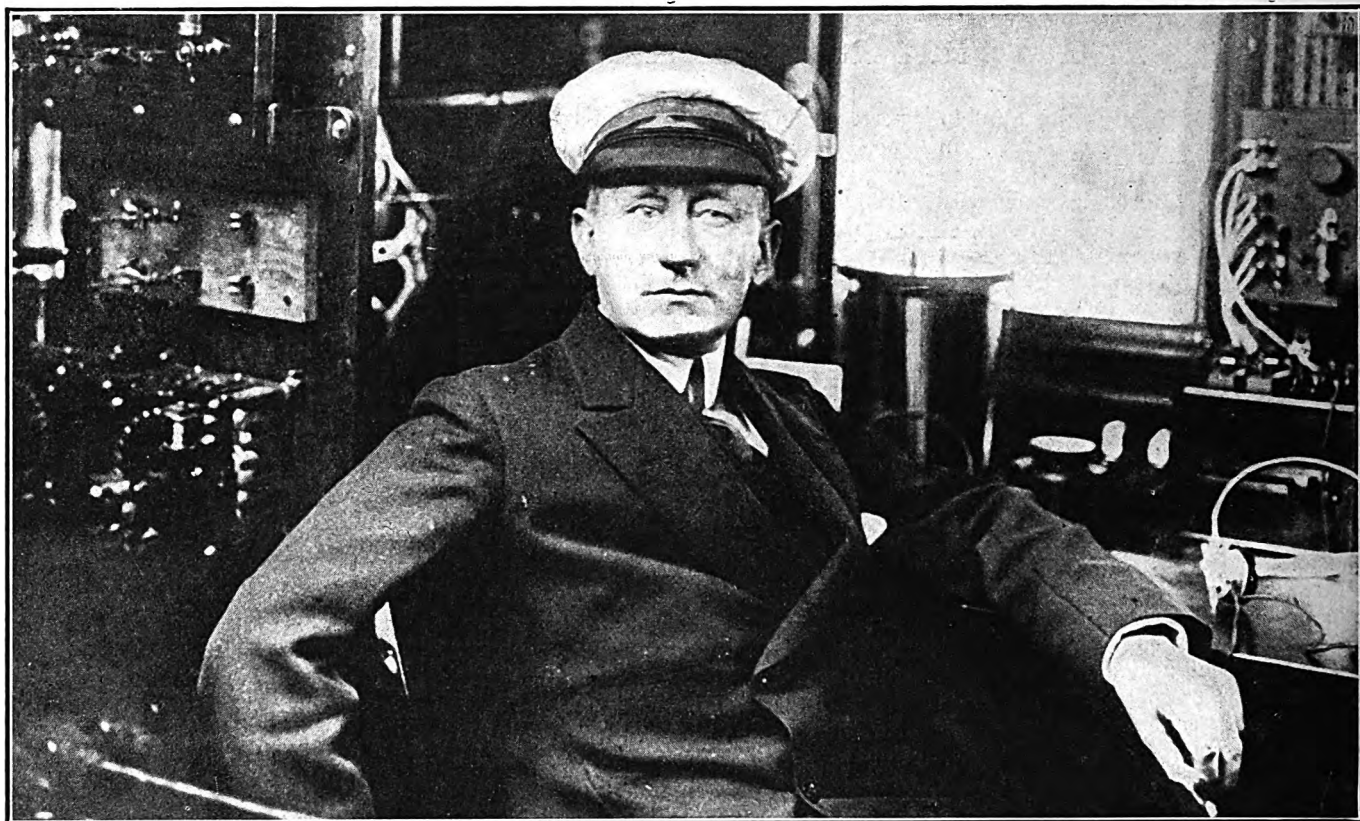
The principal remaining part is the diaphragm. This is the thin black disc which fits down tightly over the phone case. It may be of iron or of mica with a small iron piece fastened to the mica directly over the magnets.

What is the disc for?

The disc is the cause of the sounds heard in the phones. Up to the time that the disc comes into the picture, the action has been electrically, but the disc takes the electric pulsations and changes them first into mechanical

movements and then into sound waves. You know how it is when an electric fan is turned on. The blades start to rotate slowly, gradually increasing speed. At the start, the fans make a low humming noise, but the tone becomes higher pitched the faster the blades revolve. The sound is caused by the blades striking the air and producing waves which affect our ears. The disc in the phone does the same thing. As the electric waves come in through the electromagnets, the diaphragm is first drawn down by the magnetism and then released, drawn down and then released, and so on. Every time it moves it slaps the air, and the sound waves thus produced are picked up by our ear and translated into sounds.

Marconi in His Radio Studio



(c. Kael & Herbert News Service)

Guglielmo Marconi, the inventor of wireless telegraphy, is again an active worker in the field of wireless and is making further experiments in his laboratory aboard his yacht. The wireless and radio equipment on this vessel is said to be worth many thousands of dollars and is one of the most complete in the world.

Broadcast Bill's Radiolays

(Copyright, 1922, Westinghouse Electric & Manufacturing Co.)

SEEIN' we're ter be acquainted, I might as well be frank—my real name ain't no Broadcast Bill—it's Peck—my fust name's Hank—the folks at Brussels Sprouts has been a-christenin' me, I guess, 'cause of a little habit they knows me to possess. I'll start at the beginnin' and say when I was small, I couldn't git enough of news, not any way at all; I'd listen through the keyholes an' I'd harken at the doors, till news an' gab an' gossip was just oozin' at my pores. Out here in Brussels Sprouts there ain't much stirrin' all year 'round; it's so dern quiet folks kin hear things growin' in the ground; there ain't been nothin' doin' now fer—wall, now, let me see—sence Deacon Stiles drank peddlers' hooch an' cracked his sanctity. You see what it was up against—no matter how I tried, my bump of information never could git satisfied, which caused me awful sufferin' fer, you know, the thing that brings the greatest happiness ter man—is hearin' lots o' things. It was a moment in my life I never

shall ferget—the day that feller worked on me about that radio set; he had my eardrums itchin' and my



"I kin hear the universe!"

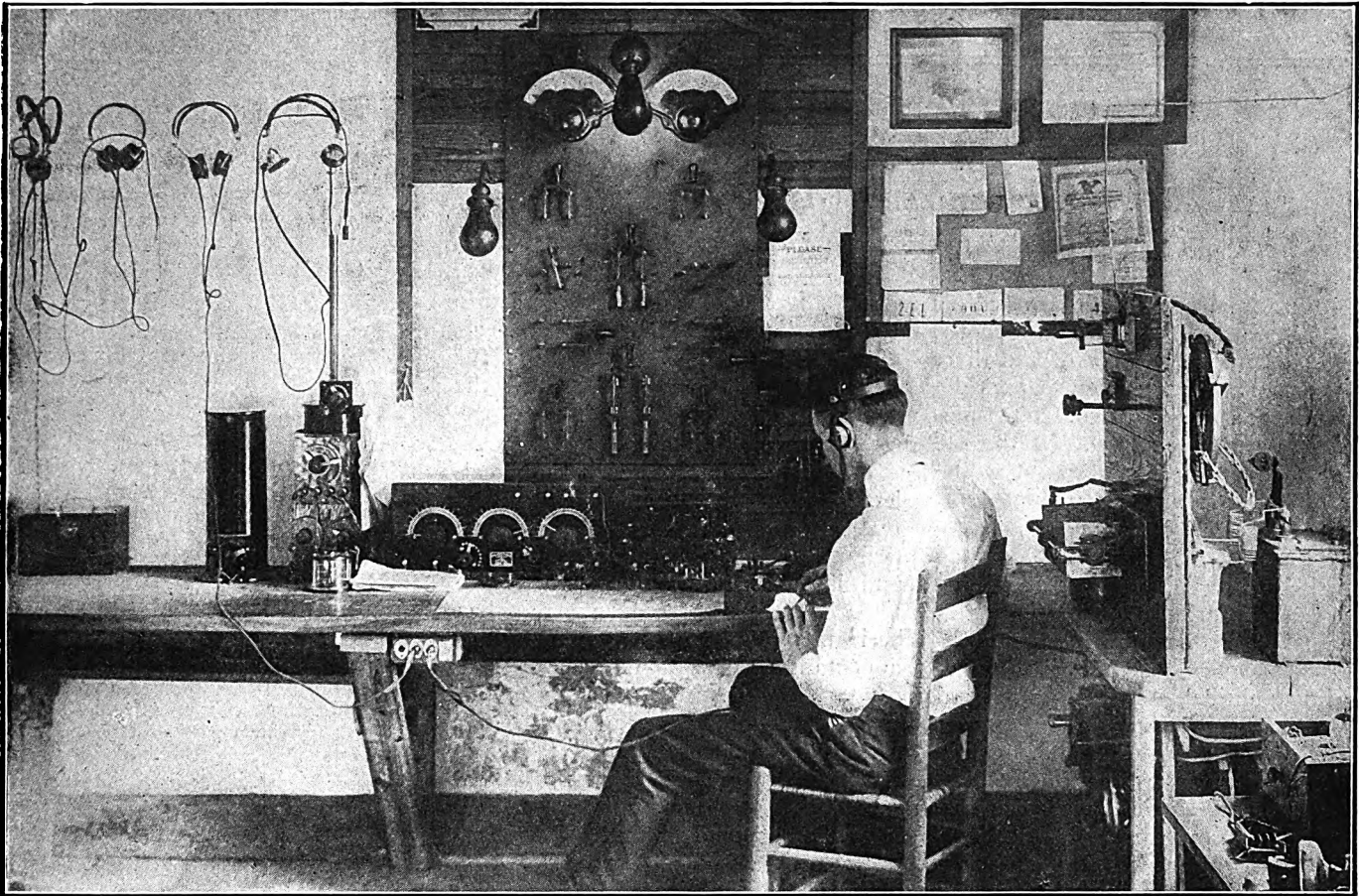
soul a-cravin' so, that I gol-dern near fergot myself—yep, hit him with a hoe! Ef he'd had a set 'long with

him er anywheres about, yep, even if he'd swallowed it—I'd turned him inside out! But one wasn't long arrivin', an' there come into my life more'n a feller ever heard—exceptin' from his wife; an' from that quarter, I remark, there's been a plenty said about me loafin' 'round with this here harness on my head; but there ain't no home-made sermons ner rollin' pins er worse, that'll stop me listen' in when I kin hear the universe! I dunno the way they work it an' I ain't a-askin' how—I only know I git the news—there goes the dern thing now!

Clearing the Pacific Air

AFTER considerable difficulty in reaching a wave length which does not interfere with the transmitting of the British and Japanese radio stations on the Pacific, the Naval Communication service has determined upon a wave length of 13,700 for east bound messages from the Naval Station at Cavite (NPO). A two-weeks test between Cavite and San Francisco (NPG) showed that with this length the signals from the Japanese station sending from Iwaki did not interfere as was previously the case.

Radio Room of 5XA, Auburn, Ala.



(e. Underwood & Underwood)

The broadcasting and receiving station of the Polytechnic Institute, Auburn, Alabama, is considered one of the most important wireless stations in the southeastern part of the United States. Alabama has been backward in developing amateur radio work, and, as a result, few stations are working. The Auburn station has no elaborate layout of apparatus or anything that makes a big flashy show; but what the operators have done proves it to be wonderfully efficient. The call of the station is 5XA. This station has been heard in thirty-five States and in Canada. This photograph shows the operating room of 5XA. Note the two spark-transmitters located in the rear of the homemade switchboard, also the receiving equipment laid out on the table, with a number of phones for additional listeners.

Results from Vacuum Tubes

THE vacuum tube is still a puzzling piece of apparatus to a great many who have just become interested in radio, when in reality it is a comparatively simple affair. In the first place there are several different types of tubes on the market, chief of which are the tubes put out as radiotrons. These tubes are also known sometimes as Cunningham tubes. Among the various types of these tubes are the U. V.-200 type. This is a detector tube only and the U. V.-201 is an amplifier. The difference lies in the fact that the first tube has a small amount of rare gas left in it, while the amplifier tube is exhausted to a very high degree.

The tube known as the U. V.-202 is a 5-watt transmitting tube, and the U. V.-203 is a 50-watt transmitter. The largest type is known as U. V.-204 and is rated as 250 watts. This type of tube is also known as a P tube

and is the one that is universally used by the broadcasting stations. A station such as WJZ uses five of these large tubes, the retail price of which is \$110 each. This may make some of the amateurs, who are averse to paying \$5 for a detector tube, feel that, after all, they are lucky that they do not have to use P tubes.

Another type of vacuum tube is the A-P. These are made in only a very few sizes, principal types being the electron relay, which is a detector; and the A-P amplifier tube, which is another of the tubes that are exhausted to a high degree. Both of these tubes are very good and consume a little less current than the radiotrons.

Easy to Operate Radio

If you are interested in radio and want to receive broadcast concerts and lectures, says the Boston "Traveler,"

don't let lack of technical knowledge deter you. The most marked recent development of radio has been in making available receiving sets which anybody can operate by following a few simple directions. Operating a complete receiving set, which can be installed in any home, is no more difficult than operating a talking machine.

Neither should you hesitate to get a receiving set for fear of lightning. All commercial receiving sets, to-day, comply with fire underwriter regulations and include simple devices which make it impossible for lightning to enter your home through radio aerials.

Fear of electric shock, as expressed in communications to "The Traveler," is based on lack of information. The electric current necessary to make possible the reception of sound waves sent through the air is very faint. It could not possibly injure, even if it were not properly insulated, as it must be in any workable radio set. You have much more cause to guard against shock when tuning up your automobile.

Radio Merchandising

Radio Advertising

Present Market Conditions Indicate that the Weekly Publication Is the Best Proposition

THERE are several well-edited monthly publications devoted exclusively to radio, and there are hundreds of daily newspapers devoting a column or two, sometimes whole sections, to radio. As the old Kentucky Colonel said about whiskey, all advertising is good but some is better, i. e. more economical and effective.

A daily newspaper is, after all, just a newspaper printed on cheap paper, bought for two or three pennies principally for its news, such as baseball, sporting, political, etc. It is quickly and only casually scanned, then thrown away. We are ashamed to be seen reading yesterday's paper; in fact, feel a diffidence in reading a morning paper on the way home at night. So a radio advertisement has a pretty short life in any daily newspaper and, of course, it's out of the question to use in the dailies a good 120-screen half-tone cut, often so necessary to properly illustrate a radio instrument or accessory.

Radio advertisers now have an

ideal advertising medium in RADIO WORLD, which has none of the defects of either the monthly or the daily, for RADIO WORLD is a WEEKLY, the only national weekly devoted exclusively to all angles of radio.

RADIO WORLD is printed on excellent paper, so the finest cuts and illustrations can be used, is so well edited that it not only interests, but instructs, and is carefully read and observed. (We have yet to see a copy that has been thrown away). And the most important feature is its quick-action results. Advertising copy reaching RADIO WORLD office even as late as Wednesday P. M., starts the advertiser's telephone ringing with orders the following Wednesday A. M., and brings a whopping mail of orders Thursday.

Quick action is needed to-day in business more than ever before. The weeklies have come into their own—such as "The Saturday Evening Post," "Literary Digest," "Collier's," and for radio—RADIO WORLD, the one Radio Weekly.

Department Stores Expect Big Radio Sales

THE Radio Conference, called by the National Retail Dry Goods Association, was held last week in the Hotel Pennsylvania, New York City.

Those in attendance represented 500 department stores, located chiefly in the eastern part of the United States, doing a yearly volume of business in department-store lines amounting to one half billion dollars.

The conference was in session several hours, discussing the systematic merchandising of all radio equipment. Before adjournment, a committee of five representing geographical divisions of the United States, was appointed to continue investigation and report. The committee is composed of F. W. Tully, R. H. White Co., Boston, Chairman for the New England division; C. S. Hammond, Frederick Loeser, Brooklyn, for the North Atlantic Seaboard; Joseph Fisher, of Kirby, Block & Fisher, resident buyers, New York City, for the South; Joseph V. Ryan, of the J. L. Hudson Company, Detroit, for the Middle West; and Alfred Fantl, resident buyer, New York City, for the West.

The discussion in the course of the conference covered very thoroughly all possi-

bilities of radio development, more especially under its merchandising aspects. The members present felt that the new, popular science presents wonderful business opportunities, although all were fully informed as to the difficulties of supply and demand prevailing at present.

There was general recognition of the fact that the business of supplying radio equipment must undergo radical changes; that the existing enormous demand may slacken, and again, that the entrance of new producing concerns may create a surplus of supply.

It was the sense of the meeting that the department store is definitely needed for the full development of radio because only those business enterprises which are well established, large in their operation and complete in their resources are qualified to handle it on the scale of greatness and thoroughness which it requires. Every opinion expressed emphasized the consideration that the sale of all radio material must be essentially a service-giving business. It was pointed out that, where some receiving sets may be of standard qualified to satisfy every demand on the part of the public, others may not

give the satisfaction which stores of the standard of those participating in the conference must always provide, whatever the merchandise. It was agreed that any store handling radio merchandise must be prepared to know all about that merchandise and to stand behind it once it has been sold.

After adjournment, Lew Hahn, managing director of the National Retail Dry Goods Association, remarked that radio is a merchandising undertaking and that the association does not merchandise. It may be necessary, he added, to organize, outside of the association, a separate corporation which can take charge of the general merchandising aspects in the interests of the public as well as of merchants.

Public Must Not Be Bamboozled

Editor, RADIO WORLD: I have been very much impressed with the first two issues of your publication; so much so that I enclose my check for one year's subscription, which please mail to my residence, 72 Beverly Road, Kew Gardens, Long Island, N. Y.

My interest in radio is first, as an amateur; and, second, on account of being interested in lyradion, which has already been introduced and well received, and which we expect to have definitely on the market within a few weeks.

Since you are likely to hear more of lyradion later, you may be interested to know something of the policy behind it. It will be for the radio public to judge as to the merit of our product; but our policy will be to produce an instrument of the highest quality, workmanship, and efficiency, to unequivocally maintain the quality of the product, and to back it up with service. This is an ambitious program. Behind it is a group of men who are entitled to confidence.

I have still another point of interest in your paper—the vigorous manner in which you start in to fight for absolute truth and perfect square dealing in the new radio industry. This speaks volumes for the character of your paper and your availability for leadership in the radio publishing-field. You have acted wisely. Nothing would damn radio more or interfere with the impetus it has achieved than for the public, which is new to the subject, to be bamboozled by the claims of unscrupulous advertisers and stock vendors. I am with you in all that makes for the constructive development of the industry. I am also with you in all properly directed effort to curtail the efforts of those who may not deserve the confidence of your readers.

It so happens that I can offer real assistance, for I am identified with the work of the National Vigilance Committee of the Associated Clubs and in position to promise you the cordial support and active co-operation of that militant agency for truth in advertising. By later mail I will send you an official letter from the committee on this subject.—H. D. Robbins, H. D. ROB-BINS & CO., Investment Securities, 61 Broadway, New York.

Radio Merchandising (Continued)

Communicate With Them

Editor, RADIO WORLD: Can you furnish us with a list of reliable manufacturers of long-distance radio-receiving sets? We contemplate the installation of a radio department and are anxious to get in touch with sources of supply.—H. C. Petersen Company, Inc., 20 Oneida St., Utica, N. Y.

Editor, RADIO WORLD: We want to know what kind of outfit would be best to merchandise here in Bay City, Michigan. As the nearest forwarding station is located in Detroit, we are told that the \$15 or \$18 outfits are too small to be of any service to any one here; that a more expensive outfit is needed.

Please inform us as to your best judgment on the cheapest and best radio outfit on the market.—A. Kowaleske, 105 Fourth St., Bay City, Mich.

Editor, RADIO WORLD:—I am a dealer in phonographs, musical instruments, etc., and I am trying to analyze the radio market, with a view to stocking up on appliances and equipment complete for all manufacturers.

Therefore, I am eager to obtain a list of all manufacturers who specialize in the production of radio essentials or accessories. Can you furnish me with such a list? If you cannot will you please advise me where I can procure the same?—H. Leviten, 551 East 138th Street, New York City.

Trade Notes

THE Rialto Radio Corporation, Times Square, New York, have their demonstration room fitted up as a living room furnished with wicker furniture, oil paintings, lamps and a Persian rug. Here the prospective purchaser can hear the concerts come in over any kind of a receiver from a portable set to a large cabinet style.

* * *

The Rex Radio Sales Corporation have opened offices at 1452 Broadway, New York City, where they will act as distributors and selling agents for everything in radio from a binding post to a machine. They are organizing a large sales staff and are preparing an extensive advertising campaign to distribute and promote the sale of the products they will handle. The officers are Harry L. Urdang, president; Abraham Lipton, treasurer.

* * *

The Universal Radio Service Association, with offices at 300 Madison Avenue, New York City, are just putting on the market their "URSA" receiving set. This company will also distribute to the trade everything in radio parts and equipment and offer an expert radio service.

Frederick Winkler Moves

One of the oldest firms in the radio business is the Frederick Winkler, Jr., Company. For fifteen years it has been manufacturing standard parts and sets at 304 Columbus Avenue, New York, but due to the sudden expansion of the business, has been obliged to take larger quarters at 59 Park Place, New York City. There it has a modern plant occupying 1,800 square feet and a large force of employees.

Will All New Firms Join This List?

RADIO WORLD wants to keep its Radio Merchandising Department up to the minute in order that it will be of value to all engaged in every phase of the radio trade—a trade that is increasing daily, that will engage millions in capital create huge payrolls for skilled workers of both sexes, and draw considerable money from the fast-growing army of radio fans; for the day is certain to dawn when, so far as the American home is concerned, radio will be as popular as the phonograph, if not more so.

We begin in this number the publication of a list of dealers and jobbers in radio supplies in the United States. The list is classified by geographical sections, beginning with New England States. Watch for the name of your firm in your particular territory. If it is not recorded here, send it in for publication. It may mean business to you. Also send along any trade notes of interest—anything that may be of value to the radio trade.

Simply address your letter: "Editor RADIO WORLD, 1493 Broadway, New York.

North Atlantic States

(Continued)

Royal-Eastern Elec. Supply Co., 114 W. 27th St., N. Y. City. (Jobbers).
S. & N. Radio Supply Co., Inc., 2106 Broadway, N. Y. City.
Sorsinc, Inc., 80 Washington St., N. Y. City.
Sterling Radio Equipment Co., 2723 Copper Ave., Brooklyn, N. Y.
Sunbeam Electrical Supply Co., 71 3rd Ave., N. Y. City.
Times Appliance Co., 145 W. 45th St., N. Y. City.
United States Electrical Co., 10 Ditmas Ave., Brooklyn, N. Y.
Dreyfuss Sales Corp., 179 Greenwich St., N. Y. City.
Frederick Winkler, Jr., 304 Columbus Ave., N. Y. City.
United Electric Stores Co., Braddock, Pa.
Elec. Equipment Co., 147 N. Center St., Corry, Pa.
Lehigh Radio Co., Center & Fairview Sts., Bethlehem, Pa.

Keystone Radio Co., Greenville, Pa.
Lancaster Electric Supply Co., Lancaster, Pa.
Star Cabinet Shop, Lansdale, Pa.
Bear-Cat Battery Service, Lemoyne, Pa.
K. & L. Electric Co., 427 Olive St., McKeesport, Pa.
Leon D. Quick, Milesburg, Pa.
Pennsylvania Mfg. Co., New Castle, Pa.
Valley Elec. Co., New Kensington, Pa.
E. P. Noll & Co., Philadelphia.
Penn. Marconi Wireless School, Philadelphia.
Philadelphia School of Wireless Telegraphy, 1533 Pine St., Philadelphia.
Quaker Light Supply Co., 728 Arch St., Philadelphia.
Sayre-Level Radio Co., Philadelphia.
Simplex Radio Co., 1013 Ridge Ave., Philadelphia.
Frank H. Stewart Elec. Co., Philadelphia.
Doubleday-Hill Electric Co., Pittsburgh.
The King Radio Co., 113 Sheridan Ave., Pittsburgh.
Ludwig-Hommel & Co., 530 Fernando St., Pittsburgh.

New Radio Firms and Corporations

Metropolitan Radio Corp., Manhattan, \$20,000; J. Sanacory, E. Yers. (Attorney, D. Kassel, 256 Broadway.)

Susquehanna Radio Co. of Williamsport, Pa., Wilmington, radio apparatus, \$250,000; (Corporation Service Co.)

Radio Glass Corp., Manhattan, general glazing, \$10,000; B. Hermaan, L. Cohen, C. Sinclair. (Attorneys, Meier & Vanderveer, 290 Broadway, New York.)

Haynes Radio Co., Manhattan, \$25,000; A. J. and T. C. Haynes, C. E. Sprague. (Attorney, B. V. Butterfield, 60 Wall St., New York.)

Aerex Radiophone Corp., Manhattan, \$12,000; F. C. Edson, W. P. Foss, Jr., C. H. Messmore. (Attorney, H. J. Bailly, 32 Liberty St., New York.)

Empire Radio Corp., Manhattan, capital increased \$1,000 to \$10,000.

Man-Day Radio Corp., Manhattan, make apparatus, \$5,000; S. J. Grossman, V. Stein, H. V. Leonard. (Attorneys, Bowman & Shea, 416 Broadway, New York.)

National Radio Sales Corp., Jersey City, N. J., radio apparatus, \$150,000. (Registrar & Transfer Co.)

Independent Radio Corp of America, radio instruments, \$500,000; Abraham Schneider, May Wechsler, Brooklyn; Peter Glasstetter, New York. (Corporation Service Company.)

Torris Radio Apparatus and Vacuum Tube Co., radiophones, \$500,000; Samuel Torrisi, Joseph Torrisi, Charles Salkind, Philadelphia. (Corporation Service Co.)

Radio Outfitting Corp., Manhattan, \$5,000; G. E. Ward, H. T. Booth, F. A. Hahnel. (Attorney, J. A. Walsh, 51 Chambers St., New York.)

Radio Instrument Co., Wilmington, Del., transmission, \$900,000. (Corporation Trust Co. of America.)

Clarkson Radio Equipment, Wilmington, \$2,000,000. (Colonial Charter Co.)

Standard Radio Corp., Del., \$500,000; has designated E. L. Flanagan, 15 Broad St., as representative.

Radio Engineering Company, electrical sound machinery, \$50,000; Walter S. Harris, Jeanette B. Harris, March Frazer, Minneapolis. (Corporation Service Co.)

Cosmopolitan Electric Co., Manhattan, contracting in electrical work, \$5,000; L. and R. Bayer, M. F. Rotberg. (Attorney, E. E. Fuchs, 51 Chambers St., New York.)

Addition W. Brown Electric Co., Brooklyn, N. Y., has changed name to A. W. Brown Electric Co.

King Radio Corp., Manhattan, \$20,000; neys, York & York, 7 Dey St., New York.)

Easter Radio Corp., Wilmington, Del., apparatus, \$1,000,000. (Corporation Service Company.)

Radio and the Woman

The Latest Gossip About the Feminine Enthusiasts of the New Marvel of Civilization---News of Women's Organizations and Up-to-the-Moment Items



(C. P. & A. Photos)

The only woman member of Congress, Representative Alice Robertson, of Oklahoma, is hoping to broadcast her appeal for re-election, to her constituents, despite the ruling of Secretary of the Navy Denby that political speeches shall not be broadcasted out of Washington over the only available station—that of the Navy Department. The photograph shows how the receiving set is installed in the office of Representative Robertson.

IT has been set down as a scientific fact that when telephones were first installed on the New York Exchange, boys were employed as operators, but, later on, were supplanted by girls because they were found to be better adapted to the work. This same feature may present itself in the radio field.

* * *

The announcement that department stores plan to carry better grades of radio goods holds out alluring prospects of future bargain-hunting tours.

* * *

"One great advantage of the ear-piece," voices a friend afflicted with headaches, "is that when one doesn't happen to feel in the mood for listening in, it's an easy enough matter to hang up the instrument until the desire to hear again comes on."

* * *

For the enlightenment of those who believe that woman's interest in radio has only been recently awakened, the following excerpt from a book entitled "The Wireless Man," published by The Century Company

somewhere in the vicinity, of a particular steamer. No one knows just where the young lady lives—it may be Connecticut, New York, or New Jersey—but they look upon her as an old friend. She sends regularly from her home to a brother who is a wireless operator on a big trans-Atlantic steamer. For two or three days after the steamer leaves New York, and again, for many hours, when she is nearing port, there is the liveliest kind of an interchange of messages between the two."

* * *

Of what great matter will it be to young lovers if the summer evening meeting-place be seats on a Coney Island boat or deck chairs on some millionaire's yacht, so long as music and romance are enhanced by the most democratic of all sciences—wireless?

* * *

A pictorially disillusioned woman friend wonders if, in the forthcoming production, "Robinson Crusoe," any of the several high-power stations now within easy range of the island on which Crusoe passed so many adventurous years of his life, will appear in a long-shot.

* * *

The statement that red-haired boys make the most alert wireless operators, ought to stimulate any slumbering capabilities possessed by our Titian-haired beauties.

* * *

It is an amusing as well as an interesting coincidence, that I have seen within the past week, at least a baker's dozen receiving sets in the home of as many friends. On none of them lay a pipe, cigarette case, or other masculine possession; or was

over eight years ago, is quoted here:

"The receiving stations about New York for several years have been reading messages sent out by a girl



(C. Kadel & Herbert News Service, N. Y.)

Harry R. Martin, of New York, has perfected a system whereby hotel guests can listen in. He is photographed instructing the telephone operators how to switch on whenever a guest asks for the radio service.

there lacking some feminine touch which bespoke a woman's interest in the instrument.

* * *

A school girl declares that in case she requires a new party-bracelet, she will wear her "honeycomb coil." If she does so, I'll wager that some-up-to-the-minute jeweler will copy the design. It's certainly attractive enough.

* * *

One who claims that she is not versed in wireless, but who intends purchasing a receiving set this summer, writes to ask if the "fan" aerial has anything to do with cooling the temperature of the immediate neighborhood in which it is erected!

* * *

"Radio has its faults as well as its virtues, like everything else," sighed one stay-at-home wife whose husband is so engrossed in their radiophone that he fails to take her to the theater at night. "But I shouldn't complain about that," she adds, "when I come to realize what great pals he and my brother have grown to be since they've found wireless a congenial stamping ground."

* * *

The problem of loading up the receiving set to receive longer wavelengths, is one that does not trouble a certain girl whose fiance is an employee of the Tarrytown Radio Research Laboratory.

* * *

At least one woman's scientific mind is evolving the problem of "making motion pictures talk." I agree with her when she remarks: "Just because phonographs failed in this respect, I see no reason why radio should not come up to requirements."

* * *

A friend utters the fervent wish that the needs of the average servant in the American home might be broadcasted. She claims that many a capable domestic, who understands spoken English, but who is unable to read advertisements inserted in various "want" columns, could be reached and obtained through this means.

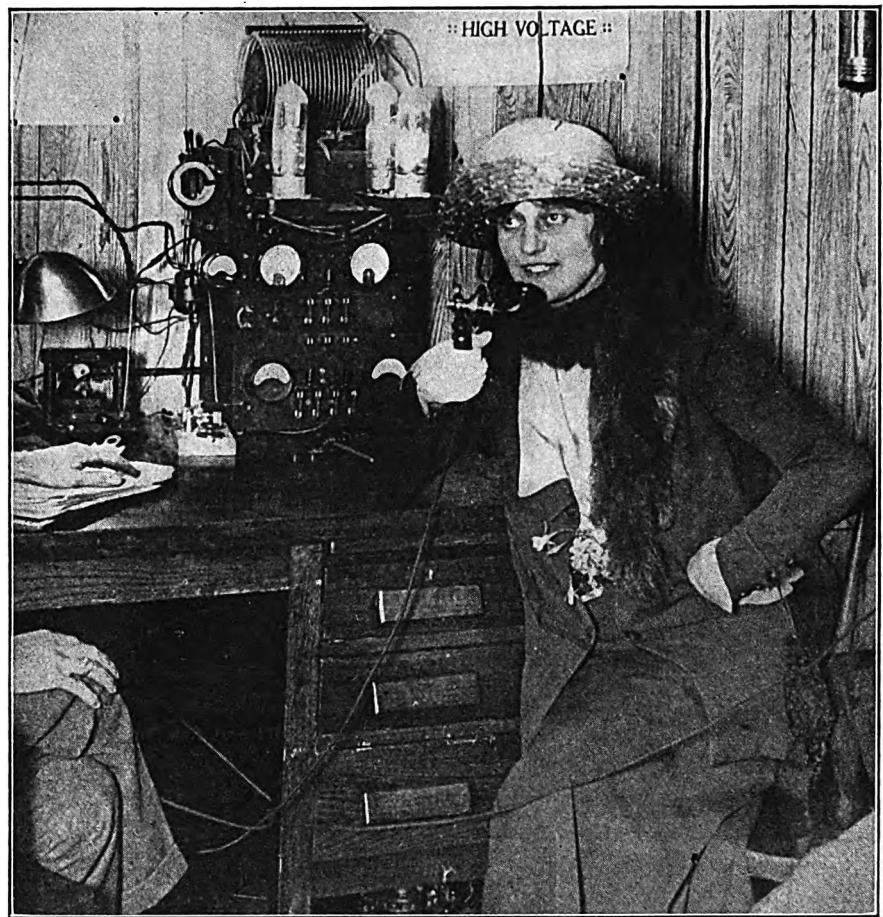
* * *

It should be of interest to women to note that Miss Alice Robertson, Congressional representative from Oklahoma, was among the nation's lawmakers who gave strong support to a bill extending the use of radio.

* * *

A young private-secretary who believes that what's worth doing at all is worth doing well, is learning the Continental Code. I inquired why:

"For the same reason that a typist studies the 'touch' system," she answered. "I'm a radio fan and expect to remain one. Knowledge of a code makes broadcasting a lot more fun!"



(c. Underwood & Underwood)

Alma Gluck, famous as a grand opera star, talking into the radio sending set in the office of the "Atlanta Journal," Atlanta, Georgia, to the government station at Fort McPherson, Georgia.

An amateur receiving-set atop a discarded kitchen-cabinet, bookcase, the drawers of which had been removed and the whole mahogany stained and varnished—served as an attractive assets to a girl's den which I entered recently.

* * *

High above the sound of voices that acclaim this great new science which is being developed for us come the notes of another voice that must be heard: the voice of those dear deaf people whose eyes grow wistful when they read of radio. Wizards of Wireless may your magic not fail to reach to them!

* * *

A prospective June-bride expresses the wish that her wedding ceremony may be performed where it could be broadcasted to faraway parents, who, though denied the privilege of attending, might at least, listen in on the service.

* * *

A certain clever young actress is rehearsing a radio monologue which she expects to present in vaudeville.

* * *

"That wireless shall be instrumental in bringing about universal peace,"

is the unuttered prayer in many a devoted mother's mind as she bends over her young sons.

* * *

A manager in a New York department store voices the opinion that in order to answer the inquiries and meet the demands of the great number of progressive girls who wish to build their own receiving sets, women instructors will be placed in radio departments.

* * *

In fact, the department stores are going to be among the biggest promoters of radio. They will constitute a chain of broadcasting stations across the continent with every station fully equipped to take up sendings.

* * *

Let me tell you of a dear old lady who lives where "it rains a great deal," asks if—when she's selecting a receiving-set—I would advise that she buy an "umbrella aerial." She tells me in a postscript that she knows there is such a thing because her grandson often refers to it and she judges it to be an aerial particularly suited to wet climates!

—Rose R. G.

RADIO WORLD

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BY RADIO WORLD COMPANY

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Answers to Readers

I USE a variocoupler, variometers in plate, grid circuits, vacuum-tube detector, and Murdock 2,000-ohm phones. I have gone over my lead-in, etc., and find that everything is properly insulated; but everytime the telephone rings, I can pick up the receivers and listen to the ordinary telephone conversations. Please suggest a remedy for this trouble, as it interferes with radiotelephony.—H. P. Reynoldsville, Pa.

Carefully look at your antenna. Does it lie in parallel with any telephone line. See that no telephone feed-line runs in back or around your receiver. If a telephone line lies in close proximity to your antenna and ground circuit, it is probable that you are amplifying signals from this feed line.

RADIO WORLD further suggests that you look over your connections carefully for feed telephone-lines. If you locate any, try to run your feeds at right angles. Inform us as to results.

What is the average voltage of a storage battery for filament lighting? Will dry batteries answer this purpose? What is your expert advice on filament lighting?—K. L., New York City.

Batteries run in various sizes and, of course, have various voltages. The average voltage for filament lighting requires 6 volts. Use no more, or you will burn out all of your tubes. Dry batteries are of no use as their life is very short. They are an expensive proposition. By all means get a storage battery. If you have direct current, make yourself a charging outfit such as is described by E. L. Bragdon, in **RADIO WORLD**, No. 5, dated April 29.

Can I use No. 22 d.c.c. wire for a variometer described in a recent number of **Radio World**. Where does the fixed condenser go?—P. M., Brookline, Mass.

Yes, you can use the size wire you mention. Your fixed condenser should be shunted around the phone.

In the tickler feedback set, is the inductance a separate winding or not? Where does it go?—H. L. M., Perth Amboy, N. J.

The tickler coil you mention is one winding placed in series with the plate circuit and mounted inside the end of the main coil, beneath the two sections of the main winding which have twenty turns each.

Can I use a King amplitone-horn with my galena set?—K. C. D., Newark, N. J.

You cannot use any horn with a crystal set. Whenever signals are of such volume that you can hear the music—say, a foot away from the phones—then use the horn. Would suggest that you use more phones connected in the circuit.

Can a good regenerative-set be made using honeycomb coil? Will it work as well as a high-priced regenerative-receiver, using two variometers and a variocoupler? Is the De Forest circuit using two primaries and one secondary as good as either of these.—H. S. S., Nyack, N. Y.

The difference between the set using the honeycomb coils and the regenerative using the two variometers and variocoupler, lies in the fact that the former will give better results on longer waves, while most of the latter type of set will not work on wave lengths of over 600 to 800 meters.

Owing to the large numbers of questions received from readers it is impossible to answer all in this number. Your replies will appear in the next or future numbers of **Radio World**.

For sort waves, the variometers are hard to beat. These circuits are both regenerative, while the De Forest circuit you mention, is not regenerative. All three circuits are excellent in their respective fields, and it is difficult to compare their relative merits. Each is supreme in its class.

Can I hear Newark on my crystal set? I live in the lower part of Manhattan?—N. C., New York.

We cannot estimate the exact distance that any set will receive. Readers are requested not to ask this sort of question, because no man can answer it satisfactorily.

To whom shall I write regarding an amateur license?—A. B., Watertown, N. Y. Address: Radio Service, Custom House, New York City, N. Y.

I have a regenerative set and can hear WJZ and WNO very clearly, but cannot seem to hear Pittsburgh. Will you tell me what to do in order to hear this station?—S. G. L., Curransville, Pa.

As you become more of an expert in the manipulating of your set, you will find out that you can tune him in. The set you have, perhaps, is a difficult set to tune. Possibly your aerial could be longer, but we believe that Pittsburgh cannot be received every night on account of the "fading." This peculiarity can not be explained.

Where is station 2XAI?—R. R., Binghamton, N. Y.

2XAI is the experimental license of WJZ. This call, as a rule, is used when the station is undergoing some experimental test.

I have a crystal set that works very well; but, once in a while, I hear howls and hums. What is the cause of this?—P. R. G., Jersey City, N. J.

You may be near some testing station; or, you probably have alternating current in your home near which some feed-line is running very close to your set; or, the aerial lies parallel with a feed line. Look over this very carefully; also, look for loose connections as this may cause some peculiar noises.

Can I use a regenerative receiver using a telephone line as aerial?—J. P. M., The Bronx, N. Y.

You may use this, but it is not advisable. Put up a single wire aerial about 100 feet long for the best results.

In **RADIO WORLD** of April 8, you published a diagram of a crystal detector-set. I have a similar set, I get spark signals only. Advise what to do?—P. M., New York City.

Evidently you are too far from a broadcasting station to receive concerts using a crystal detector. If you wish to hear the concerts you must use a vacuum tube instead of a crystal, and, later on, for loud-reception you have the advantage of increasing a stage or two of amplification.

Will wires buried about a foot in the ground serve as a good lightning ground?—A. B. G., Bloomfield, N. J.

Yes. They will be all right if you bury enough of them and have them as long as possible.

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Attach the Wolverine Aerial to any electric light socket in your home and receive good results from your receiving set. Fool proof and no danger. It comes ready to use; just screw into light socket and connect to aerial post of set. Save cost of wire and lightning switches. Will operate on blub or crystal sets. Guaranteed to give good results. Price \$3.50, postpaid. (\$4.00 west of Rockies.)

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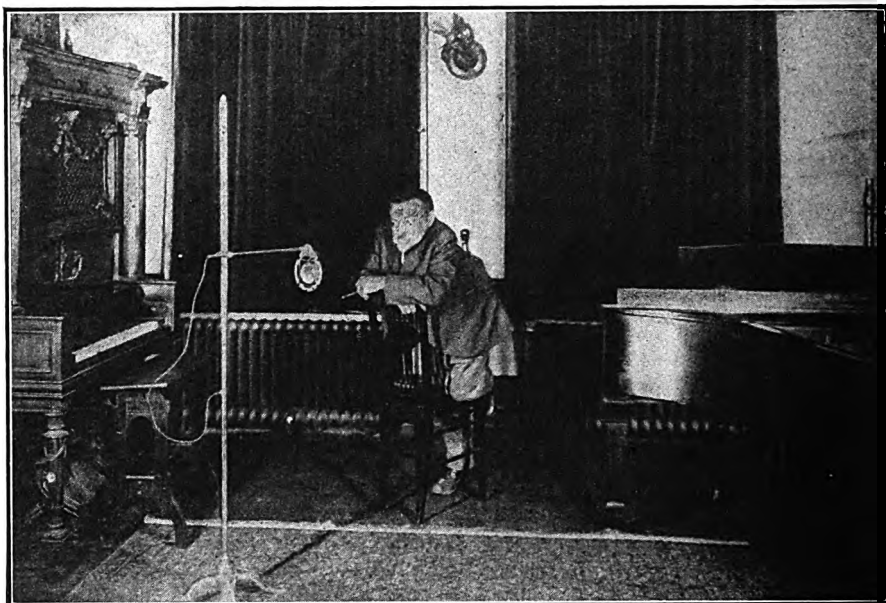
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Says Radio and Light Are the Same



(c. International)

Charles P. Steinmetz, chief consulting engineer of the General Electric Company, Schenectady, N. Y., who recently startled the world by announcing that he had made artificial lightning in his laboratories. Dr. Steinmetz is photographed speaking into the radiophone. He recently announced that radio waves and light are the same thing, the only difference being in the wave length.

New Radio Clubs

(Send RADIO WORLD items similar to the following. We want to keep a record of all clubs and their activities.—Editor, RADIO WORLD.)

HARRISBURG RADIO ASSOCIATION, Chartered by State of Pennsylvania, secretary-treasurer, L. G. Krause, 1912 Market St., Harrisburg, Pennsylvania. Receiving station located in Public Service Commissioners Building, Market Street. Outfit in use, Westinghouse. Membership

fee, or share of stock, \$10. Annual dues, \$5. No member can hold more than one share of stock, but must buy one share to become a member. Membership includes leading State officials. The club held a demonstration in Penn Harris Hotel, last week, in connection with A. T. & T. officials; talked to San Francisco and Havana. Continental wire and cables. Picked up ship "America" 400 miles out at sea.—**MAXWELL H. HITE & SON**, per Maxwell H. Hite.

TOTTENVILLE RADIO CLUB, organized April, 1921. 157 Bedell Avenue, Tottenville, Staten Island, N. Y. Robert A. Fuller, publicity director.

UNITED RADIO CLUB, Defiance, Ohio, C. O. Haley, secretary.

Actors Do Not "See" Radio

While recognizing radio as a scientific marvel, the members of the Actors' Equity don't think so much of it as a dispenser of entertainment unless it brings them financial return.

The council of the organization, at a recent meeting, went on record to that effect with the following resolution:

"Resolved, That the attention of our members be drawn to the fact the radiograph is a profitable commercial enterprise, which also in a way enters into competition with the theater and that, therefore, our members be advised to seek proper compensation for any services they may be invited to give to the radiograph companies."

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"Are your new neighbors modern people?"

"Modern? Say, they sent in last night to borrow our radio set!"—*Buffalo Express*.

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VARIABLE CONDENSERS

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CRYSTAL DETECTORS

CRYSTAL SETS

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Robin Radio Mf'g., Co.

47 WARREN ST., NEW YORK CITY

"Boss of Air" for Western States



(c. International)

Major J. F. Dillon, United States Radio Inspector for the States of California, Nevada, Utah and Arizona, holds a somewhat envious office. As "boss of the air" of those commonwealths, he is privileged to break in on any radio conversation or message. No secrets are kept from him.

"Stick to Aerials," Says Maj. Gen. Squier

When Major-General George O. Squier, Chief Signal Officer of the United States Army, announced that he had perfected "wired wireless" as applied to the radiophone, it looked pretty easy. Instead of attaching his receiving set to an aerial, he attached it to the electric light on his desk and received a perfect concert. Immediately radio fans throughout the country tried the stunt and many of them blew out their sets.

They had forgotten, or did not understand, that the broadcast must be transmitted along the lighting main if it is to be received from the lighting main.

"The set requires a special plug," General Squier has since explained, "but not special wiring. However, even the special plug will not give results unless the transmitting station is sending out broadcasts along the electric light mains. I did not receive a broadcast sent out on an overhead aerial. It was from a station which transmitted on the electric light mains.

"The advantages of the line radio method of broadcasting are many. The ether channels for radio broadcasting are limited, and even the few wave-channels which are available can be more profitably employed for such radio activities where space is the only or best method of communica-

tion. Also, since there is no radio interference caused by broadcasting on power lines, any number of wave channels may be employed and therefore multiplying the number of stations that can be operated on the same line."

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RADIO WORLD'S QUICK ACTION CLASSIFIED ADS

This department is intended for everybody who wants quick action on short announcements covering the buying, selling, exchanging or general merchandising in the radio field. Readers of RADIO WORLD will find that it pays to read these columns every week. Advertisers will get a ten-day service here—that is, copy received for this department will appear in RADIO WORLD on the news-stands ten days after copy reaching us.

The rate for this RADIO WORLD QUICK ACTION CLASSIFIED AD. DEPT. is 5c. per word (minimum of 10 words, including address), 10% discount for 4 consecutive insertions, 15% for 13 consecutive insertions (3 months). Changes will be made in standing classified ads., if copy is received at this office before 4 P. M. on any second Tuesday preceding date of publication. RADIO WORLD CO., 1493 Broadway, New York City. (Phone, Bryant 4796.)

WANTED—A few Western Electric VT-1's, VT-2's and head sets for use in our laboratory. Must be perfect. State quantity and lowest price. Reading Radio Shop, Box 6, Reading, Mass.

Short wave (crystal) receiving sets, not including phones, \$5.00. A. D. Nichols, Springfield, N. J.

Buy Direct; variometers, \$3.35 up, according to size, variable condensers, 23 plate, \$2.90, enclosed detector, \$1.35 dials, 3ins., 85c; 4inc., \$1.20, all other parts and complete sets at similar savings, mail order filled. G. C. Dee, P. O. Box 107, Brooklyn, N. Y.

We buy your Radio goods. Head sets wanted. Radio Shop, 1246 Gates Ave., Brooklyn, N. Y.

Crystal set that gets Radio Concerts. Build it right boys. Plans and full instructions for building at low cost, high grade fine adjustable Crystal Receiving Set, fifty cents postpaid. Dept. R. D. Shaw Mfg. Co., Galesburg, Kans.

FOR SALE—One De Forest Loose coupler mounted with primary switch and seven honey comb coils. Cheap. Gehhardt, 9532—114th St., Richmond Hill, L. I.

"News for the Radio Fans. Amateurs and beginners." A "Dixie Jr." crystal Detector set. Complete without phones \$2.00, cost less than renewal one bulb for local receiving. Tested and copyrighted 1922. R. H. Dixon, 185 Milford Ave., Newark, N. J.

Radiophone Wiring Diagram. Send 25 cents. J. E. Dunphy, 52 Bramhill St., Portland, Maine.

WANTED for spot cash. High grade Radio outfits, parts, attachments and materials of standard makes. No home made apparatus will interest us. Address F. J. Lamb, 1938 Franklin St., Detroit, Mich.

Wireless phone "B" Battery—direct from manufacturer. Large \$2.00, small \$1.00. Post paid 22½ volts. Wireless phone "B" Battery Co., 321 Canal St., New York.

Enclose self-addressed envelope and receive free illustrated bulletin of 22 up to date Blueprints of Receiving and Transmitting designs. We are the largest firm in the country specializing solely in Blueprints. Number 349 gives full constructional and other data for building Crystal Receiver for only \$5.00. Ask for bulletin 44. Experimenters Information Service, 45 Pinehurst Ave., New York.

Are you interested in the stage? New York Star is an illustrated National weekly paper devoted to the American stage in all its branches. Articles by experts. Reviews of new Broadway plays. Gossip of legitimate vaudeville and motion picture players. Ten cents a copy, \$4.00 a year. Trial subscription, three months, \$1.00. New York Star Co., 1493 Broadway, N. Y. C.

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1.50 Caragon Rheostat 1.35
4.50 Amplifying transformer 4.00
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5.00 Vacuum tube 4.50

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WANTED—Men—Boys over 17. Become Railway Mail Clerks. Commence \$133 month. Common education sufficient. List positions free. Write immediately. Franklin Institute, Dept. E 152, Rochester, N. Y.

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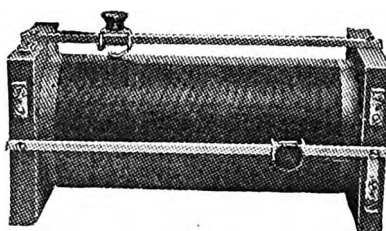
Washington Conference

WASHINGTON, D. C.—The second session of the Radio Conference, appointed by Herbert Hoover, Secretary of Commerce, to prepare a draft of an agreement of wave-length assignments for amateurs and commercial transmitting stations has received a set back from Congress. It is claimed that the radio law, as outlined by the experts assembled at the convention "doesn't mean anything." The members of Congress have been making a close study of the proposed measure as planned by the conference.

Senator Frank B. Kellogg, of Minnesota, and Representative Wallace White, Jr., of Maine, with the aid of some of their colleagues who are interested in radio, will redraft the bill. It is now undergoing complete overhauling, according to Representative White.

While the Congressmen approve the general principles of the recommendations of the radio conference, which extend the authority of the Secretary of Commerce to patrol the ether as the property of the public, they disapprove of the way the bill is written. Senator Kellogg and Representative White claim that it contains too much technical lingo and confusing phraseology. What Congress hopes to do is to write a law that any radio fan can easily understand.

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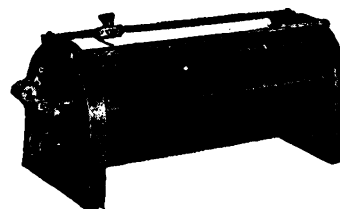
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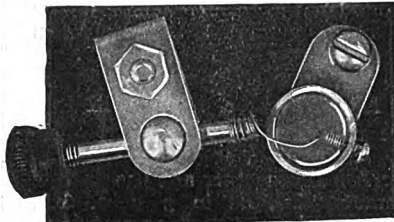
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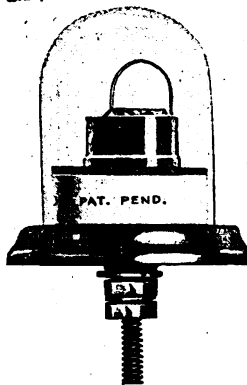
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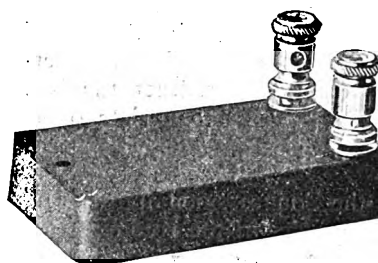
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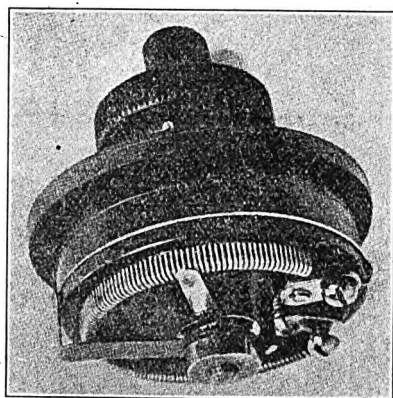
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RADIO WORLD

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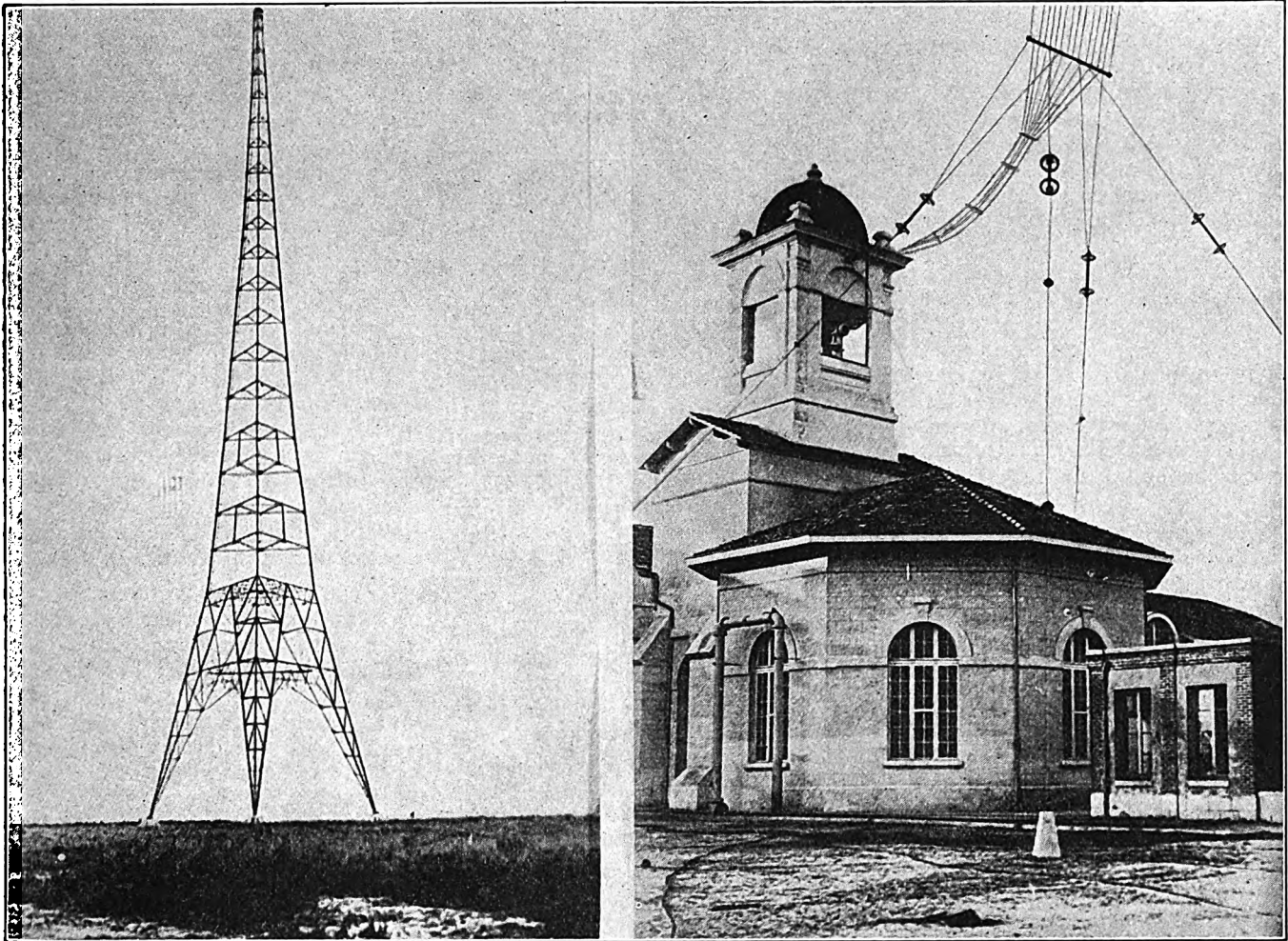
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Vol. I. No. 7.

May 13, 1922

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This Station Transmits 4,000 Miles!



(c. Kadel & Herbert News Service)

The great radio station at Lafayette, France. It was built by the United States Navy to facilitate America's part in the World War and, recently, was sold to France. The photograph at the left shows one of the many high towers and, at the right, the building which contains the equipment. Radio waves are transmitted from this station on a wave length of 23,000 meters, approximately 14 miles. They are heard some 4,000 miles distant, particularly between Bordeaux and Washington, and, occasionally, as far east as French Indo China, some 6,000 miles away.

WHEN you ask, "How far?" when speaking of radio in this advanced day, the adult who wondered what his boy saw in the marvel of communication a year ago—and even the boy himself—answers in miles. But it won't be long before the answer—and absolutely correct at that—will be handed out in quarter turns of a little black knob; for radio is affecting geography just as it is affecting many other fields. When one can sit before a loud-speaker and listen to speeches and concerts from faraway cities, remoteness loses much of its mystery.

Wave lengths are not an infallible index to the power of a radio station nor to its sending range, but they indicate comparative strength at least roughly.

The powerful, well-equipped station at Lafayette, near Bordeaux, France, which was built by the United States Navy to facilitate America's part in the World War, and since sold to France, operates on a wave length of 23,000 meters, approximately 14 miles. This station until recently unchallenged as the world's most powerful station, sends its radio despatches with ease, and instantaneous-

ly, of course, over 4,000 miles of water.

Lafayette's title to first place is now challenged by the commercial station at Port Jefferson, Long Island, New York, which, if it is not more powerful, will be when additional units are added. The Port Jefferson station sends on a wave of 19,000 meters—the second longest wave—nearly twelve miles, and is employed in transmitting messages as far as Germany—about 4,000 miles. The United States Navy has six powerful stations located in different parts of the world.

The Reason for the Loop Aerial

By George W. May, R. E.

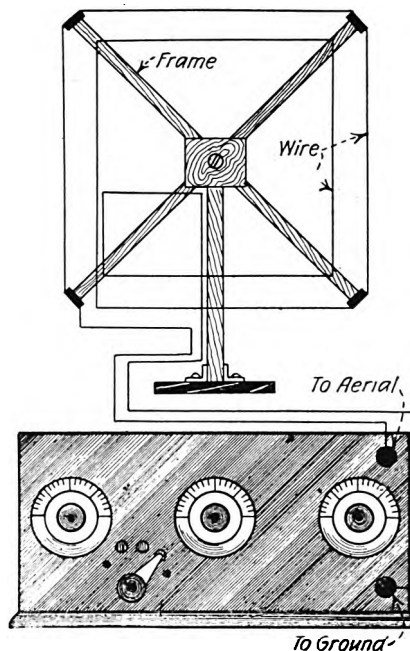
THE loop aerial is a subject about which many amateurs have asked for information. In the first place, the loop aerial cannot be used with a crystal set, and it cannot be used with only one vacuum tube unless the receiving station is very close to the transmitter, and the signals as heard on the ordinary aerial are very loud. For best results, at least two stages of amplification are absolutely necessary. Even then the signals will not be as loud as with the out-door type of aerial.

Of course, the loop is used indoors; but it is not necessary to have the windows open, as the ether waves will pass through anything. It is well to remember, also, that the loop aerial is very directional in its effects, and it must be arranged in such a way that it can be revolved about its axis. By revolving the aerial in this way, it will be found that much interferences can be tuned out, while the desired station can be made louder; but, even then, it will not be as loud as with the outdoor aerial.

The loop aerial is the same thing that is used on shipboard, and known as the radio compass. It is very easy to take cross-bearings with this type of aerial and, thereby, enable the operator to locate a sending station. It is of practically no use unless the operator has a good set at his disposal. Referring to the drawing, it will be seen that the frame itself is made up of half-inch square pine, and that the outside dimensions should be at least 4 feet.

In order that the aerial may be readily turned about, it is well to suspend it from the ceiling by one of the legs. It may also be arranged on some sort of a pivoted base to enable the operator to turn it about readily. It will be seen in the drawing that the end of each leg has a small piece of bakelite fastened to it forming a tee. This bakelite strip should have a number of grooves filed in it so that the wire may be kept in place. The wire itself should be about No. 22 double cotton-covered wire, although ordinary bell-wire will do as well. The wire is started at one of the binding posts and is run through the grooves in the bakelite strip until a total of about 15 turns are in place. The remaining end of the wire is run to the other binding post.

In connecting the loop aerial up to the receiving set, it is not necessary to use any ground connection, as the leads from the two binding posts on the loop



One of the neatest forms of loop aerial. The drawing shows how the wire is wound, also the connections from the loop to the receiving set. Suggested by George W. May. Drawn by S. Newman.

aerial will serve as both aerial and ground connection. Simply connect one of the set in the place marked "aerial," and the other to the set where the ground wire would ordinarily be connected. This will make a very handy aerial for the dweller in an apartment house; but remember amplification of at least two steps is absolutely necessary to make it work at all and that a crystal detector cannot possibly be used. The outdoor aerial is far better; but if the amateur desires to do a little experimenting with the loop aerial it may be easily made.

Loop aerial reception is accompanied by a number of distinct advantages, among which are reduction of interference from other stations due to the fact that loops will only receive from stations in the direction toward which they point; they eliminate the necessity of employing any outdoor aerial or ground connection; they do not re-radiate because there is no regenerative action; they permit very selective tuning because radio-frequency amplification is employed with them.

The most important disadvantage in the use of the loop-aerial work is that the distance over which signals may be received is considerably reduced, several stages of amplification are required, the use of a large storage battery for supplying the current for the vacuum tubes is necessary, and the complete arrangement is rather costly.

Regardless of the drawbacks mentioned, loop aerials are rapidly gaining in popularity and it is unquestionably a very satisfactory arrangement for use where reception over a distance with a minimum of interference and distortion is desired. In the congested districts of large cities, loop aerials are giving great satisfaction, even though they entail a slight increase in both of purchasing and maintaining a receiving station.

A few suggestions relative to the installation and care of a vacuum tube will not be amiss at this point. In the first place, a vacuum tube has four contacts and must be connected up correctly or the tube will not operate. By looking at the socket that comes for a tube it will be seen that there are four binding-posts. These are sometimes marked G P F F. G stands for the grid; P for the plate; and the two marked F mean that these are the points for the connection of the filament. As the tube fits into what is known as a bayonet socket, it will be found that it cannot be put in incorrectly; but the beginner must be very careful to see that the binding posts are connected up right.

Usually the beginner burns out his first vacuum tube after a very short time; or, sometimes, as soon as the set is connected up. Then there is always the attempt to get a new tube for the one burned out, and usually a few words with the dealer. These tubes are all tried out and are correct before they leave the factory. The dealer usually tests the tube before it leaves his hands. The beginner, however, does not know this and invariably thinks that the dealer has tried to "stick" him. If the tube is bought at a reputable radio house, the beginner can wager on it that the tube is all right. If a vacuum tube is used with care and connected into the circuit correctly, it should last for several years.

If the set is a home-made one, the best plan to follow is to connect the storage battery first and try out the filament. If the tube does not light, you will know at once that there is something wrong. Never connect the B battery until you are absolutely certain that the wiring is correct. If the B battery is connected in such a way that the current will flow through the filament, the filament will last just about as long as it will take you to wink your eye. When this happens the best thing to do is to throw the tube away and buy another. There have been from time to time, certain firms that make a business of repair-

The Radio Valise of F. W. Dunmore

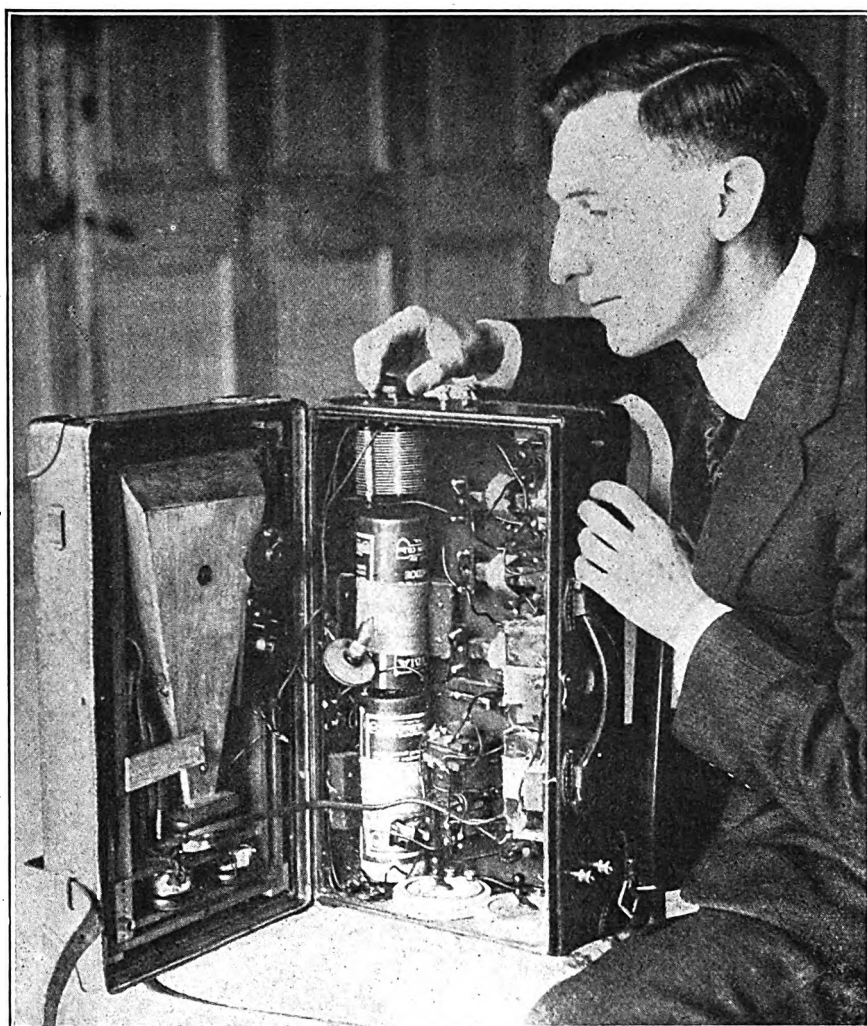
F W. DUNMORE, of the Radio Laboratory of the United States Bureau of Standards, walked into the lobby of the Drake Hotel, Chicago, the other day, carrying an ordinary suit-case. A long line of other patrons of the Drake were waiting a chance to register, so Mr. Dunmore quietly took his place at the end to wait his turn. Suddenly—just like one of those mysterious, hair-raising moments in one of those modern “who-did-it” plays—faint but distinct sounds of music wafted through the lobby from somewhere. The clerks pricked their ears, the “bell hops” thought their days of tipping were over, the house detective scented a new case, and one troubled individual from the hayseed district ran out for the police.

But the coolest person in the crowded lobby was the indirect cause of it all; and, perhaps, if Mr. Dunmore had not been so cool, suspicion would not have been directed to him. He tried to be very unperturbed—but his valise gave him away, and, in a few moments, a small crowd had gathered about the ordinary-looking leather traveling accessory, asking the owner if it were haunted.

The Dunmore suitcase is a small one—about one-third the size of an ordinary grip. If the Drake management had asked Mr. Dunmore if it contained his wardrobe, he would have been obliged to answer, “No! But it does contain a real genuine radio set—and if you are looking for concerts and other entertainment free of cost, I’ll furnish it.”

Then Mr. Dunmore exposed the innards of his valise. According to one who can write radio expertly, this is just what enables Mr. Dunmore to hear all that is being broadcasted from the nearest station:

Two binding posts at the top of the suit-case represent the aerial and ground connections. The aerial binding-post is connected to the variable



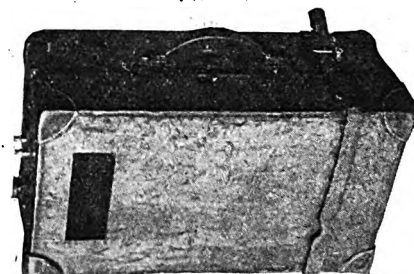
(c. Underwood & Underwood)

Mr. Dunmore exposing the “insides” of his “singing valise.”

condenser which, in turn, is in series with the first coil wound on a battery through to the ground post. This coil is better known as the primary coil. The secondary coil lies directly underneath, magnetically coupled, which is connected to the grid and filament circuits of the tube.

This set has a two-step amplifier whereby the amplifying transformers may be seen at the bottom of suit-case. To the extreme right are the B bat-

teries for the various plate-circuits. In the cover of the suit-case may be seen the telephones, home-made loud-speaker, and folding or portable loop-aerial. A demonstration of the valise



(c. Underwood & Underwood)

The suitcase closed and ready to be carried to most any distant place. Note the little window to let out the music.

was given by Mr. Dunmore while attending a recent meeting of the American Institute of Engineers. While waiting to be called for a speech, he opened his grip, turned the aerial director towards the Westinghouse Broadcasting Station, in Chicago, and picked up the closing market reports.

(Continued from preceding page)

ing burned-out vacuum tubes, but owing to the patent situation they are no longer allowed to do this sort of work. At the best vacuum tubes that were repaired in this way were very unsatisfactory and had a very short life. The beginner will do well to realize that when a tube is burned out it is absolutely useless.

In any circuit that uses a vacuum tube, it should be equipped with a grid

condenser and a grid leak. The latter piece of apparatus is not used in all sets, but it will be found that if the value is right louder signals will be received on less battery-consumption. The grid condenser is absolutely essential and cannot well be dispensed with. Remember that when a vacuum tube is used in the circuit, care must be exercised if the tube is expected to give results.

The Principles of Radio Telegraphy

By *Walter J. Howell, A. M., I. R. E.*

Deputy Radio Inspector

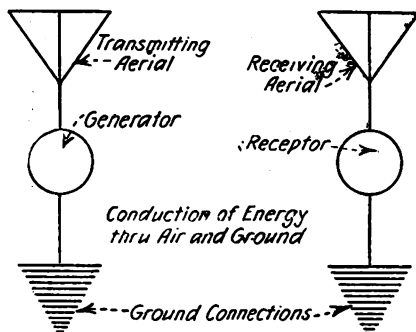


Figure 1 shows the three elements required for radio, namely generator, conduction and receptor. Drawn by S. Newman.

THE problem of conveying energy from one point to another point requires three elements which, in the case of radio, consists of the generating unit or transmitter, medium of conduction or ether, and receptor or receiving apparatus. The ether which will conduct the energy is supposed to be everywhere, so the transmitter and receiver theory will be outlined as follows.

In order to radiate electrical energy it is necessary to use alternating current of a very high frequency and, also, provide some means to radiate or throw off this energy. This sets up a disturbance in the ether—in similarity: as a stone dropped into a pond of water causes waves which grow larger in diameter but weaker in strength, radiate in all directions. Means are provided for collecting part of this radiated energy, and the receiving set, when adjusted properly, gives indication that energy has been received.

Figure 1 shows the simple outline of generation, conduction, and reception. Wires elevated in the air act as one connection to the transmitter and receiver, while an earth connection is used for the other element. It is obvious that if the radiated power is turned on for a short space of time that a dot may be sent, while if turned on for a longer period a dash may be sent, so that, with the aid of a code in which each letter is a combination of dots and dashes, intelligent signals may be sent between two points.

One of the simplest ways to produce high-frequency currents is to use the discharge of a condenser

across a spark gap and through a coil of wire or inductance. Figure 2 shows how the three units are connected. The condenser is usually charged with high voltage derived from a spark coil or transformer. When the charge on the condenser plates becomes high enough, the voltage ionizes the air between the spark gap—thereby making a conductor of it—and the current jumps the gap which, through heretofore, had been an insulator. This current in traveling through the coil of wire sets up lines of force about the coil; and the moment that the condenser ceases to supply current, these lines of force, or magnetic field, collapse upon the coil and generate a current owing in the same direction as the original current and thereby charge the condenser in the opposite direction.

This second charge then flows back again and the process is repeated a number of times. The original current oscillates back and forth until voltaic pressure is equalized, and while there are only a few oscillations and they take place in an exceedingly short period of time, we have the required high-frequency current. This current can be radiated by coupling a coil of wire to the first coil and extracting part of the energy which is then radiated by means of the aerial and ground connection.

Figure 3 shows the general layout of a spark-transmitting set, a key being provided in the power line to turn the current off and on in the form of dots and dashes.

A sixty-cycle current supply to the power transformer will give 120 sparks per second across the spark gap. Each spark will consist of a number of high-frequency oscillations, so it will be seen easily how it is possible to transform a low-frequency current

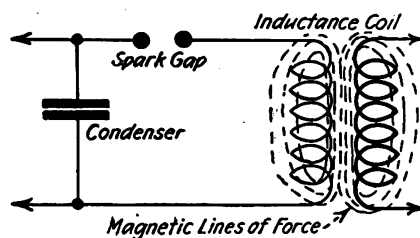


Figure 2 illustrates how the magnetic field acts about a coil of wire. Note the lines of force about the coil as to direction. Drawn by S. Newman.

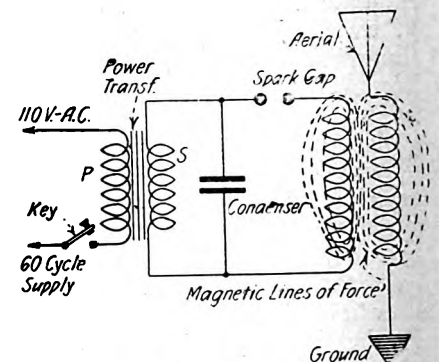


Figure 3. A circuit of a plain transmitter is here shown, explaining the power needed also the equipment. Drawn by S. Newman.

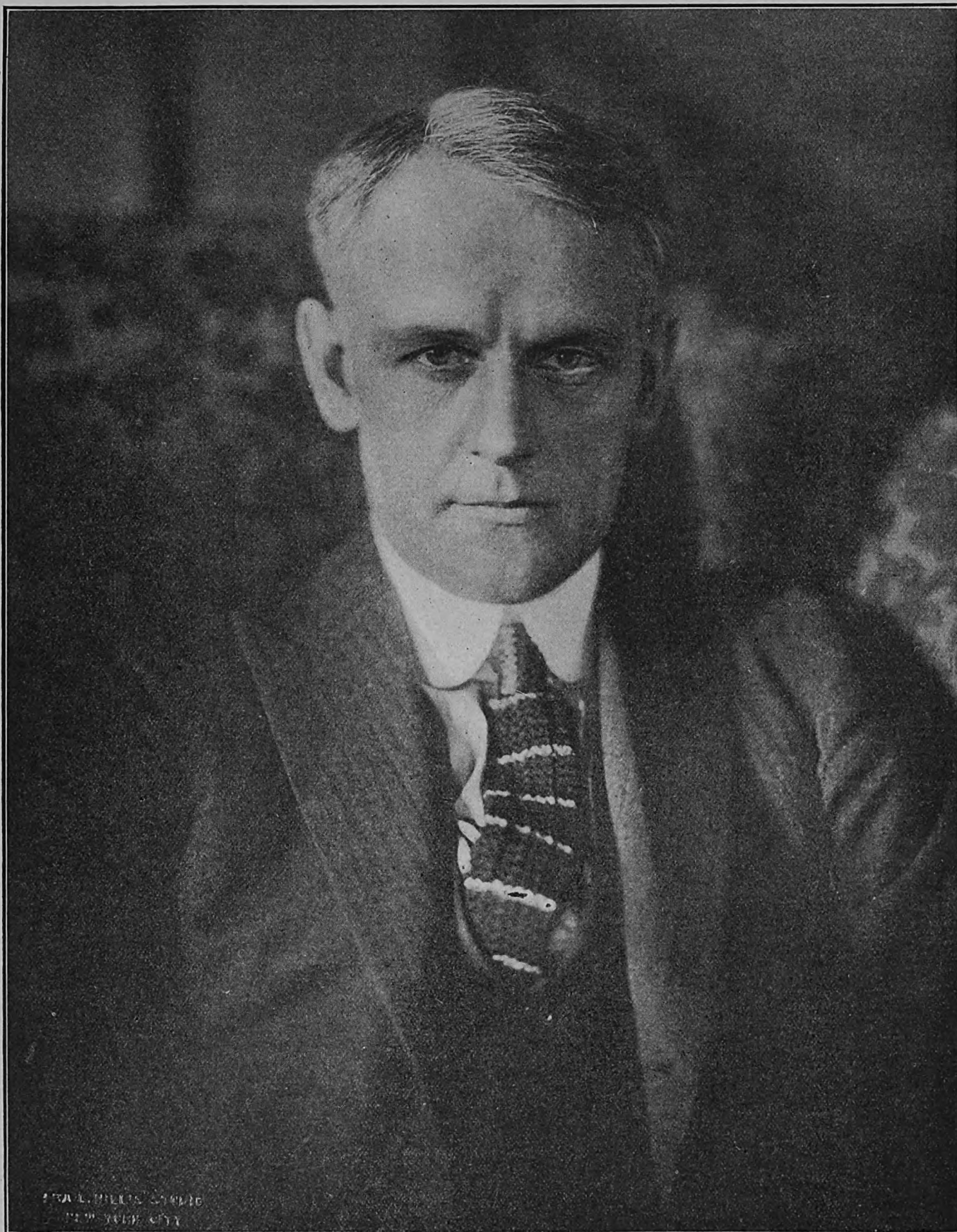
into a high-frequency current for radiating purposes.

At the receiving station, an aerial and ground connection are used to receive a very small part of the energy sent out by the transmitter which, in turn, flows through the receiving apparatus. The coil of wire connected to the aerial and ground is used to adjust the set to the same period of electrical vibration as the energy sent out by the transmitter. This is called resonance, or tuning, and is the same as adjusting the string of a violin so that it will vibrate when a certain key is struck on a piano. It is only when this condition prevails that the greatest energy will be received from a sending station.

The received current, while it is broken into 120 groups per second, really consists of high-frequency impulses which cannot be heard by the human ear because the period of vibration is too high, so that simply connecting the telephones across the tuning coil will give no results because of the high-frequency. It is necessary then to rectify these impulses and change them into direct-current impulses. This is done by means of the crystal detector.

The crystal detector allows current to pass through easily in one direction, and the energy is stored up in the small condenser which in turn, passes through the telephones and causes the diaphragm to move once for each impulse. It can easily be noted that a series of impulses, in rapid succession, would give a great many vibrations per second. A person listening would say that a buzz was heard.

Radio World's Hall of Fame



(Ira L. Hills Studio, N. Y.)

ROY A. WEAGANT

Known in the radio field as an experimenter, his objective being the elimination of static. This disturbance means millions of dollars each year to the many radio corporations and thousands of radio amateurs. He has devised a number of circuits whereby static may be eliminated to a smaller degree. Mr. Weagant is at present consulting engineer of the Radio Corporation of America. He was awarded the Liebmann prize for 1920.

My Practical V-T Detector and Two-Stage Amplifier

By Frederick J. Rumford, A. I. E. E.

THE drawings illustrating this article picture the writer's private detector and 2-stage amplifier which have been in use for over a year and from which he has obtained the very best results. This set was designed by him for the sole purpose of efficiency, simplicity, and compactness. It requires but very little work to build, and should cost about \$50. This price includes the tubes. As every amateur knows who has purchased the average detector 2-stage amplifier sets, the tubes cost extra.

This outfit is so compact that I have often carried it from city to city in my travels. It can be mounted in a cabinet, if desired. It can be easily duplicated and requires but a

but, no doubt, most all amateurs have the necessary parts laying around their "labs." It will take only a very little while to assemble this outfit when ready. Below are the list of necessary items, with their respective costs:

2 Formica panels, 7x4½x¼ inches	...\$3.00
2 Rheostats for back mounting at \$2..	4.00
2 Clapp-Eastham Amplifying Transformers at \$4	8.00
1 V-T Detector tube at \$7	7.00
2 V-T Amplifier Tubes at \$7	14.00
3 Murdock V-T sockets at \$1	3.00
3 telephone jacks at 85c	2.55
3 grid leaks and condensers, .0005 mfd. 1 megohm at 50c	1.50
1 telephone plug at 75c .....	.75
25 inches round ¼-inch brass stock or rod .....	.30
15 inches flat brass-stock ¼-inch wide ½-inch thick .....	.25
5 feet bare copper wire B. & S., No. 8 ..	.30
Screws and bolts .....	.50
8 large-size binding posts at 20c.	1.60
Total	\$46.75

In regard to the actual making of this set: The two 7x4½x¼-inch formica panels are given a dull-grain finish with No. 0 sandpaper, and then rubbed with oil. After this is done, the usual marking off and drilling of holes are done according to figures No. 1 and No. 4. The rheostats and jacks are mounted on the front panel as shown, and the binding posts are next mounted on the rear panel. The rear panel will be cut out at the corners, as per Figure 4. This gives the panel a distinctive appearance and also provides for air in case the outfit is mounted within a cabinet as, no doubt, some amateurs will build.

You will now cut down your round ¼-inch brass rod into four 6-inch lengths. They should be drilled and tapped at each end to take ⅜-inch machine screws. If the amateur isn't going to mount this outfit within a cabinet, it would be advisable to have these rods nickel-plated. For that matter, it would not be a bad idea to have all the metal parts that are exposed to view nickel-plated, as it will set off the outfit to its best advantage.

The 8 binding posts of which 4 are on each side of the rear panel, are indicated by the engraving upon the panel as follows: On the right side A is for the A battery which, in this particular instance, is a 6-volt 60-ampere-hour. Eveready storage battery B, for the B battery which happens

to consist of twenty No. 703 Eveready flashlight batteries wired in series multiple. My reason for this is that with 3 tubes functioning, the B battery will not stand up very long, and it also weakens the amplifying power of the outfit. There is a jumper wire which runs from the B battery negative to the A battery negative.

The posts on the left-hand side are as follows: No. 1 is for the tickler connection; P, plate; G, grid; F, filament. As will be seen, there are but a very few binding posts, not at all like the old amplifier sets, which had a good number of posts and were very complicated and awkward in operating. All the tubes are of the same filament voltage and the plates are of the same B-battery voltage.

As for making of the strips for the socket shelf, this is cut, drilled, and tapped as per figures No. 2 and No. 3. The sockets are then placed upon the strips and held in place by the means of screws and nuts. Size is left to the amateur's own judgment.

The sockets are to be spaced evenly or equally apart, leaving a little margin of space at each end. The assembly in turn is mounted between the two panels as per figures No. 2 and No. 3 and held there by means of screws, which are passed through the panel and secured on the back by nuts. The brass rods may now be taken and screwed between the panels. The two Clapp-Eastham amplifying transformers can now be fastened to the back of the rear panel by means of screws and nuts which are properly spaced, as shown in fig-

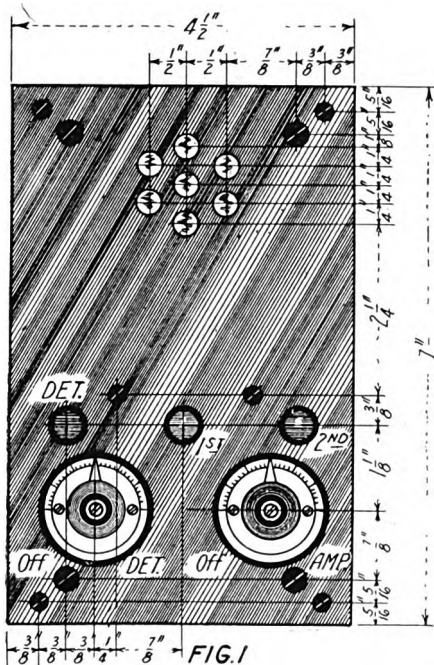


FIG. 1
Front panel with various parts mounted alongside. Correct dimensions are given. Suggested by F. J. Rumford. Drawn by S. Newman.

few tools. It is similar to the set the Westinghouse people are offering the public; but I wish to impress that the outfit described below was designed by me personally, a year or so ago; and I also wish to state that it has been made up by several prominent radio men, tried and tested for its true worth and has proved successful in every way. It is composed of all standard parts which can be readily purchased in any radio-supply store;

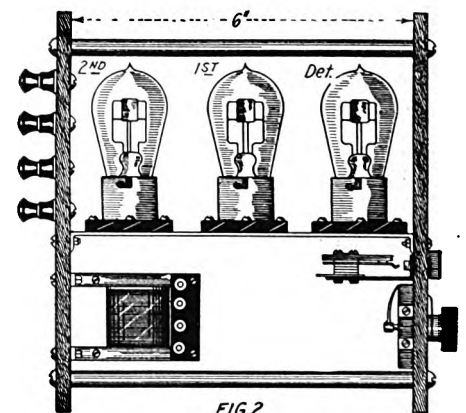
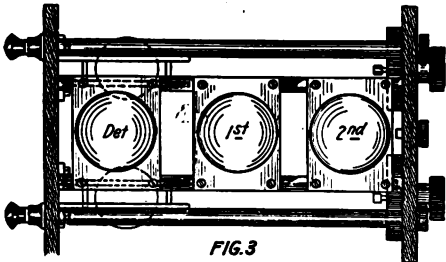


FIG. 2
Side view and interior showing position of tubes, transformers, rheostats, and jacks. Suggested by F. J. Rumford. Drawn by S. Newman.

(Continued from preceding page)
ure No. 4. As mentioned above, the holes above the jacks will give the necessary ventilation and also serve as a window, so as the brightness of the tubes filament may be observed.

Now that we have the outfit completely assembled, the next step is the wiring. This should be done with No. 8 B. & S. bare copper wire, and it is advisable to run the wire as straight and direct as possible, as No. 8 B. & S. wire is so stiff. It would be advisable to straighten the wire out making it firm and rigid.

The practical arrangement of the different parts, making most all the leads comparatively short and direct, should be noted. The wiring is extremely simple. I have connected the positive terminals of the filaments on the sockets together by one wire running straight across. I also have one wire running from the negative terminal to the front panel and across the width, having the two rheostats connected from it to one side of each. The other side goes to each individ-



Looking down into the interior from the top. Suggested by F. J. Rumford. Drawn by S. Newman.

ual tube socket, having one side of the amplifying transformer secondary connected to it. The three jacks connected on one side to the plates of each individual tube, and, on the other side to one wire which runs direct to the positive binding-post of the B battery. The two center strips of the jacks are connected to the two individual amplifying-transformer's primaries. The other side of the amplifying-transformers secondaries are connected on one side of the grid leak and grid condenser which connects directly to the tube grids of each individual tube. The end jack connects on one side direct to the plate of the last amplifying tube, and the other side connects direct to the positive side of the B battery.

The writer has omitted showing the position of the grid leaks and grid condensers which are combined. He has in the outfit described secured them to the inside of the rear panel; but he leaves that to the amateur's own judgment. They could readily be strapped underneath the socket straps.

The grid leaks of this outfit are 1 megohm, resistance and the grid condensers are .0005 mfd., capacitance. They were purchased from the General Apparatus Company. The jacks and plugs are purchased from the Federal Telephone & Telegraph Company, and the sockets were purchased at the nearest radio-supply house.

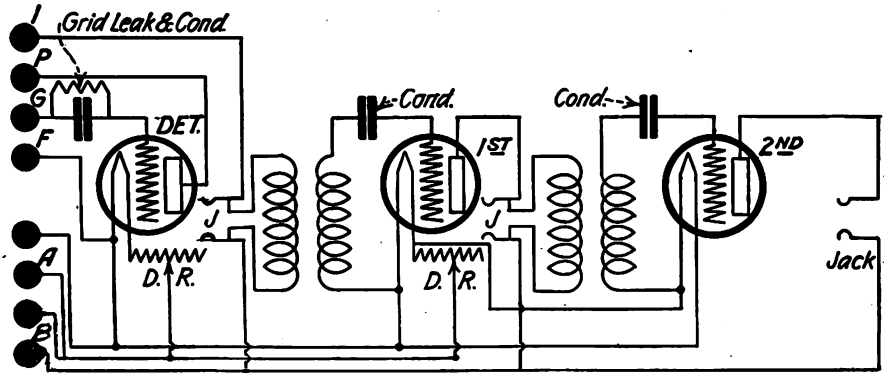


FIG. 5

The general hook-up and all of its necessary connections. Suggested by F. J. Rumford. Drawn by S. Newman.

I used the Magnavox Radio Tele-megophone with one set of binding posts connected to the extra telephone plug, and the other act of binding posts were connected to a 6-volt 40-ampere-hour storage battery, which had a rheostat connected in series, which make various adjustments and continuous service possible.

When the amateur wishes to use his loud speaker, he plugs into either jack he desires and, presto! the signals will be heard all over the room. With this arrangement, the necessity

at any time. I have used Baldwin phones for a head set.

Shunting a variable condenser across the posts marked No. 1 and F, will secure a regenerative effect; or shunting at tickler coil which may be a honeycomb coil across No. 1 and F, and a honeycomb coil across G and F will act as a secondary having the usual primary, and will make it possible to tune any wave-length from 100 to 20,000 meters with the usual variable condensers to make sharp tuning possible. It will be noted that all the apparatus is fastened to either the front or the rear panels and most all the connections are made direct from the binding posts on the rear panel, making it possible to remove the different apparatus from time to time whenever it is necessary to inspect them, for the replacing of new V-T tubes, or for the renewing of old parts.

If traveling any distance, the outfit can be easily and readily knocked down and the different parts stowed away in the corners of the bag or trunk. The complete diagram of the proper connections are shown in figure No. 5 with their proper symbols for the lettering and numbering are identical as that on the panels. To get the proper wiring for the backs of the panels, it would be advisable to reflect the drawing in a mirror—placing the drawing on top of a plain piece of paper, drawing-side up, and under this plain sheet of paper have a sheet of carbon paper with carbon-side up. This last will give the best results. Tracing the original drawing will make the proper impression on the under side of the plain sheet of paper.

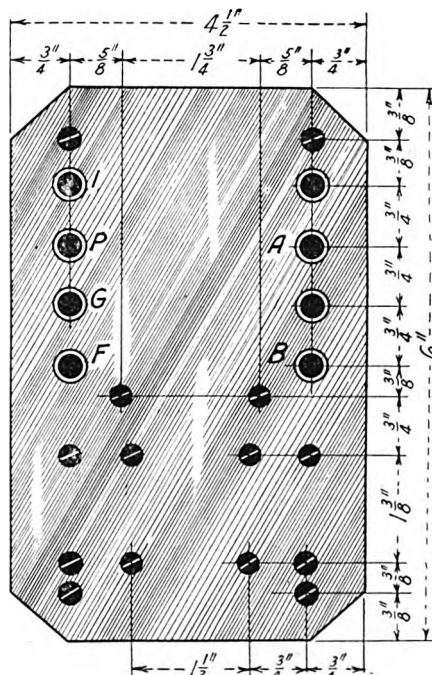


FIG. 4

The rear panel, showing the different dimensions for the placing of the binding posts and positions of the different attaching screws. Suggested by F. J. Rumford. Drawn by S. Newman.

Official Wave Lengths Favor Fans

Secretary Hoover's Radio Conference, Held in Washington, Declares Radio a Public Utility. Broadcasting Clearly Defined. Advertising by Radio Transmission Prohibited. Standing of the Amateur to be Fully Established by Law.

By Carl Hawes Butman

WASHINGTON, D. C.—Radio communication is a public utility and should be regulated and controlled by the Federal Government in the public interest. This was the opinion set forth in the final report of the Radio Telephonic Committee, appointed by Secretary Hoover, in connection with the recent Department Conference on Radiotelephony. The committee recommended that an advisory committee to the Secretary of Commerce be appointed, to consist of not more than twelve members, six in the Government and six from outside.

Practically duplicating its preliminary report, the Committee made recommendations as to wave-length allocations by classes, giving the amateur the band between 150 and 275 meters, and suggested the assignment of specific wave-lengths to each broadcasting station—except those operated by the Government—within the bands designated for such use. Experiencing great difficulty in providing even part of the general service demanded, the conference disapproved of the introduction of direct advertising at the expense of essential communication.

In connection with technical methods intended to prevent and reduce interference, authority for Secretary Hoover to prevent unnecessary interference was sought, and it was suggested that the Bureau of Standards make special studies of operating difficulties, ranges, width of wave bands, etc.

With the report in its final form, the legal sub-committee is now putting the finishing touches on a bill intended to give Secretary Hoover authority to establish and enforce regulations, which will shortly be introduced in both houses of Congress, and, it is hoped, rushed through. The committee recommended that the Secretary of Commerce be vested with authority to control the establishment of all radio transmitting stations except amateur, experimental and Government stations, and the operation of non-government transmitting stations, all receiving stations being excepted. The Committee also passed

a resolution to the effect that the types of radio apparatus found most effective in reducing interference be made available without restriction.

The assignment of 22 wave bands for radiotelephony was made as follows:

Allocation of Wave Bands

Transoceanic experiments, non-exclusive, 5,000-6,000 meters.

Fixed service, 2,850-3,300.

Mobile service, non-exclusive, 2,500-2,650.

Government broadcasting, non-exclusive, 1,850-2,050.

Fixed station, non-exclusive, 1,550-1,650.

Aircraft radiotelephone and telegraphy, exclusive, 1,500-1,550.

Government and public broadcasting, non-exclusive, 1,050-1,500.

Radio beacons, exclusive, 950-1,050.

Aircraft radiotelephony and telegraphy, exclusive, 850-950.

Radio compass service, exclusive, 750-850.

Government and public broadcasting (200 miles or more from the seacoast), exclusive, 700-750.

Government and public broadcasting (400 miles or more from the seacoast), exclusive, 650-700.

Marine radiotelephony, non-exclusive, 650-750.

Marine telegraphy, exclusive, 525-650.

Aircraft radiotelephony and telegraphy, exclusive, 500-525.

Government and public broadcasting, exclusive, 485-495.

Private and toll broadcasting, 285-485.

Restricted, special amateur radiotelegraphy, to overcome barriers, non-exclusive, 310.

City and State public safety-broadcasting, exclusive, 275-285.

Technical and training schools (shared with amateur), 200-275.

Amateur telegraphy and telephony, (exclusive, 150-200 meters.) (Shared with technical and training schools, 200-275 meters), 150-275.

Private and toll broadcasting, exclusive, 100-150.

Reserved, all below 100.

The committee established the following definitions:

Government broadcasting as that done by departments of the Federal Government; *public broadcasting*, that carried on by institutions, universities, and such stations as are licensed to disseminate information and educational service; *private broadcasting*, signifying broadcasting without charge, by a station owner, communication company, store, newspaper, organization or individual licensed to disseminate news, entertainment and

other service; *toll broadcasting*, where a charge is made for the use of the transmitting station.

Private detective agencies desiring to operate radiotelephone broadcasting stations, it was recommended, should be required to cooperate with municipal or State services in the use of the wave band 275-285.

In view of public demand for broadcasting, it was not deemed desirable to send messages over wide areas for point-to-point communication, except where communication could not be effected by other means. It was recommended that for this purpose other means should be used. An immediate study of geographical distribution of broadcasting stations was urged to secure the best service with minimum interference. Where congestion of radio broadcasting existed, it was recommended that the Secretary of Commerce assign suitable hours of operation to stations. When conflict occurs, consideration for the public not otherwise reached was recommended, and the priority of stations was established as Government, Public, Private, and Toll.

Advertising is Prohibited

Direct advertising by radio broadcasting was prohibited and indirect advertising limited to the statement of the station's call letters and the name of the concern responsible for the matter broadcasted.

Recommendations that the transmission of signals tending deliberately to interfere with the reception of official time-signals, constitute grounds for the suspension or revocation of a license were advocated in the report. Licenses for operators of radiotelephone transmitting stations, should also require a knowledge of receiving and transmitting apparatus and the International Morse Code sufficient to receive at a rate of not less than ten words per minute.

It was agreed that the operation of Government stations be conducted in such a manner as not to interfere with the commercial traffic and broadcasting, and that whenever Government-owned stations were used for the transmission of commercial traffic and

The Remarkable Ear of Radio

It Is Called the "Phonotron" or "Soup Plate" and Is Used Exclusively By the U. S. Government

By Peter Williams

A QUESTION that seems to puzzle almost every novice is "What shall I do so I can get in on the broadcasting?"

Evidently he becomes excited and starts "digging out," thinking he will learn something before the day is over. He may have something in mind, probably going around a bit, most likely getting in on some demonstrating set; and by the time he has covered a number of places he has a good idea of what is in store.

At night, looking over some pamphlets he was given, he notices a particular circuit that represents some high-class set that he had heard and seen. Finally, he answers his own question, with, "I think I will build myself a good receiver."

Immediately plans are under way. The point is soon reached whereby the necessary parts are to be purchased. On getting the gear, the assembly and lay-out are started; and, before many moons, the set is completed. Excitement follows as to what the result will be. Doubtless when the test is finished everything is working satisfactorily. This follows with a word from the experimenter how clearly the concerts are.



(c. Underwood & Underwood)

Miss Joan Wood, of Toronto, playing a piano solo at the Radio Station of the United States Signal Corps. The music she produces is caught by the phonotron.

The big hitch now looms up. It concerns the transmitting station—one of the most important elements in broadcasting. Everything at the receiving

end depends on the transmitter for clearness, tone, and volume.

In the first place, the transmitter that records the voice or music is the first element in play. So why not start right here with this. The accompanying photograph shows one, if not the best known, type of transmitter in use to-day. It is called the "phonotron," sometimes referred to as the "soup plate," and is used exclusively at the United States Station, at Fort Wood, Bedloe's Island, New York Harbor, in its broadcasting. Not only does this instrument record, but it picks up every smallest particle of energy in the transmitting room, whether it be voice or music, and, in turn, sends it on to the radio transmitter to be broadcasted. The phonotron may be used also as a receiver. It will give out sound as thoroughly as it picks it up.

With all this in view, one can readily assume that for clearness of signals, good tone quality, everything depends upon an excellent transmitter and receiver. One should not think that any receiver will give clear signals, but if a receiver is well designed there is no reason for noisy sets as the broadcasting stations try their utmost to send out clear signals.

(Continued from preceding page) broadcasting, they should conform to the regulations established.

The final report recommended that the status of the amateur be established by law and that the limits of the wave band allotted to the amateur as given above (150-275) be specified in the law, and that the amateur continue to be under the jurisdiction of the Department of Commerce.

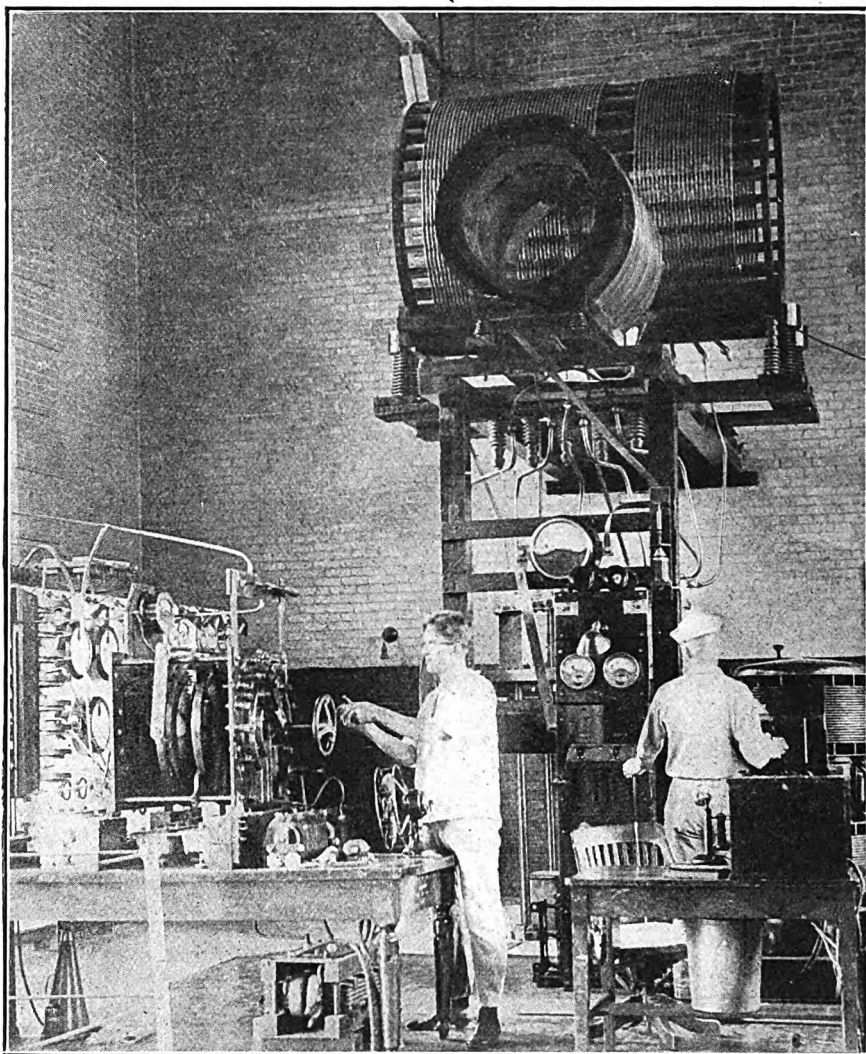
For the purpose of self-policing among the amateurs, the creation of amateur deputy radio inspectors, elected from their number in each locality, was approved; that upon receipt of notice of such election the radio inspector in charge of the district appoint the person chosen a deputy radio inspector, serving without compensation or for the sum of one dollar a year; that the duty of amateur deputy inspector should be to endeavor to the best of his ability to accomplish, under the direction of the district radio inspector, observance of the Radio Communication Laws and

the Regulations of the United States, and the observance of such local co-operative measures as are agreed to in each community for the minimization of interference between the various groups of the public interested in radio; that such amateur deputy inspectors be clothed with whatever authority might be necessary in the opinion of the district radio inspector.

It was also recommended that the waves assigned to amateurs, between 150-275 meters, be divided into bands according to the method of transmission; damped wave stations being assigned the band of lowest wave lengths, interrupted or modulated continuous wave radio telegraph stations the next band; radiotelephone stations the next band, and finally unmodulated, continuous wave radio telegraph stations the band of highest wave lengths. That amateurs be permitted to carry on broadcasting within the wave-length band assigned to amateur radio telephony, was recommended.

Uncle Sam's Big Naval Radio Station

By Fred. Chas. Ehlert



(c. Underwood & Underwood)

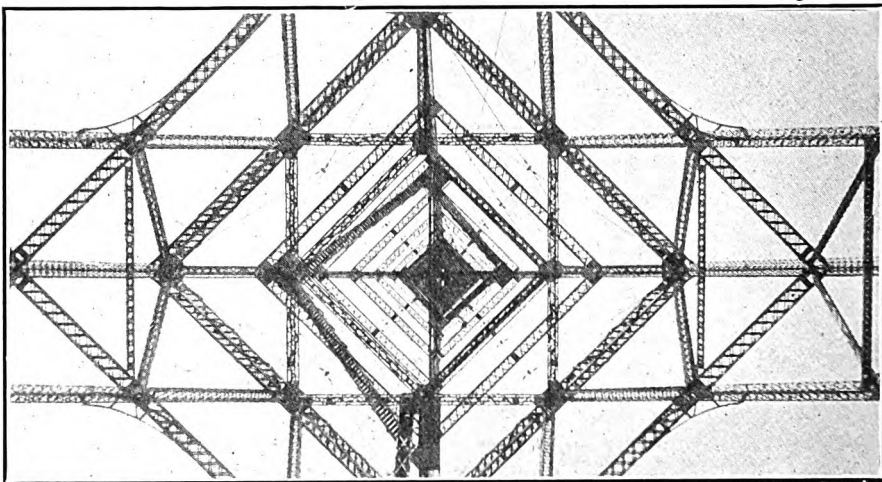
Interior of one of the transmitting rooms of the Naval Radio Station, Arlington, Virginia. On the left is a five-kilowatt spark set for working local traffic on wave lengths between 600 and 2500 meters. On the right, is a thirty-kilowatt arc-transmitter to send out continuous waves from 2500 meters, and higher, to the ships of the Atlantic fleet. It is operated by Chief Radio Electrician Weyand

necessary gear, the rooms, being arranged so that various sets can be handled without the hindrance of trouble. A five-kilowatt spark-set,

thirty kilowatt-arc, one-hundred-kilowatt spark-set make up the main equipment while a sixty-kilowatt German Telefunken-spark, with other smaller sets make up the reserve equipment should trouble arise.

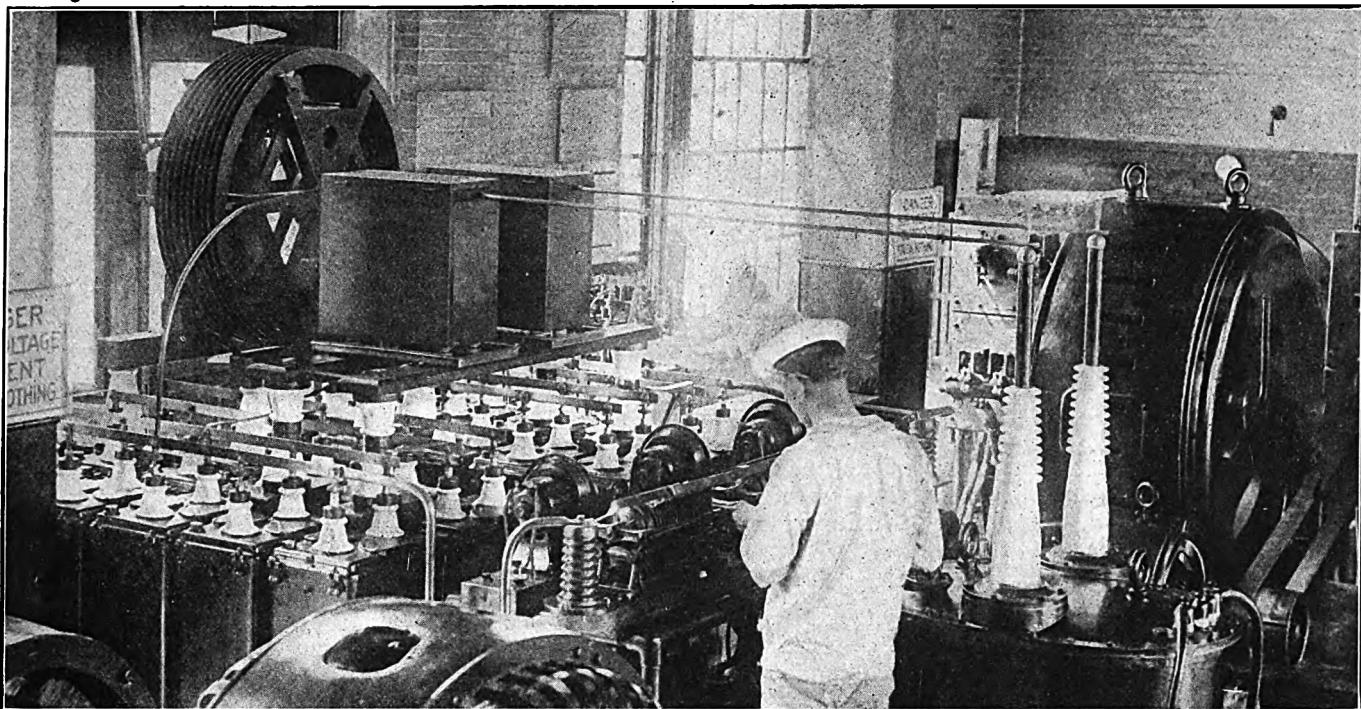
The upper left-hand picture shows a five-kilowatt Navy standard transmitter, whereby all local traffic may be handled on from 600 meters to 2,500 meters. The set is mounted neatly on the table shown, plenty of room is available in case of utmost emergency. The operator is shown watching the hot-wire ammeter for highest reading, accomplished by the proper coupling he is trying to secure. Just left of his hand, is the Ford wheel, which operates various wave lengths, with the fan blowing on the spark gaps to keep them cool. Under the table is a five-kilowatt transformer, with the inductance-coils at the extreme left of the set. On the right of the upper left-hand picture, is a 30-kilowatt arc. In operation, this set sends forth continuous waves of great power. Large inductances are used. These, a study of the photograph will show, are mounted on a rack, to carry continuous waves to wave-lengths which vary in excess of 2,500 meters. It can be seen here that sets of the damped and undamped type are available at a moment's notice. The upper right-hand photograph is a view of a sixty-kilowatt, Telefunken spark set, which is held in reserve in case the hundred-kilowatt spark-set fails the operators. One must bear in mind that all of the above sets are operated by remote control from the central control station at Washing-

MANY radio enthusiasts have heard the United States Navy radio station at Arlington, Virginia, sometimes spoken of as "Radio," but better known to the experienced radioman as NAA. This station, the largest operated by Uncle Sam, lays just across the Potomac River from Washington. Three huge towers, ranging from 450 to 600 feet high, are set in a position so as to form a triangle. A number of mighty antennas, represent, so to speak, the "mouth of the government." The buildings located near the base of the towers, are equipped with all the ne-



(c. International)

Looking up through one of the mighty steel towers of the high-powered radio station at Arlington, Virginia. This tower is 450 feet high. With the aid of its antennas, signals are sent out thousands of miles.



(c. Underwood & Underwood)

This Telefunken sixty-kilowatt spark set used by the Germans, before the World War, in their trans-Atlantic station at Sayville, Long Island, is now being held in reserve by the United States Government, but ready for immediate operation should the large one-hundred kilowatt set become incapacitated. Chief Chambers is here shown adjusting the quenched spark-gap which is the most essential element of the transmitter.

ton. This means that the operator at the Washington control station operates any particular set by simply being connected in on the proper relays. Below shows the control-board where distant operators are connected in by relays, thence to the operating or transmitting set. Once the distant operator has the control of the wire, he tells the operator, what wave he desires, and power, when in a few seconds, other switches are thrown and the distant operator has control of the set. This is an unusual feat, as the sending operator is never disconnected from the antennas, making reception possible at all times, even during transmission. The same arrangements are made for control at the Navy Observatory, where the "time tick" is sent thousands of miles to be picked up by the operators of vessels for navigation purposes, or by jewelers for regulating watches.

These time signals are sent out every day on a 2500 meter wave length (spark) in which the one-hundred kilowatt transmitter is used as a means of supply. At 11:55 a. m., every morning and at 9:55 p. m., every night, these powerful dots are broadcasted on their long journey, terminating with a long dash at the finishing hour, such as 12 noon and 10 p. m. exactly. This last tick signifies the exact second of each respective hour, previously described, whereby the observer automatically knows when the sun is directly centred over

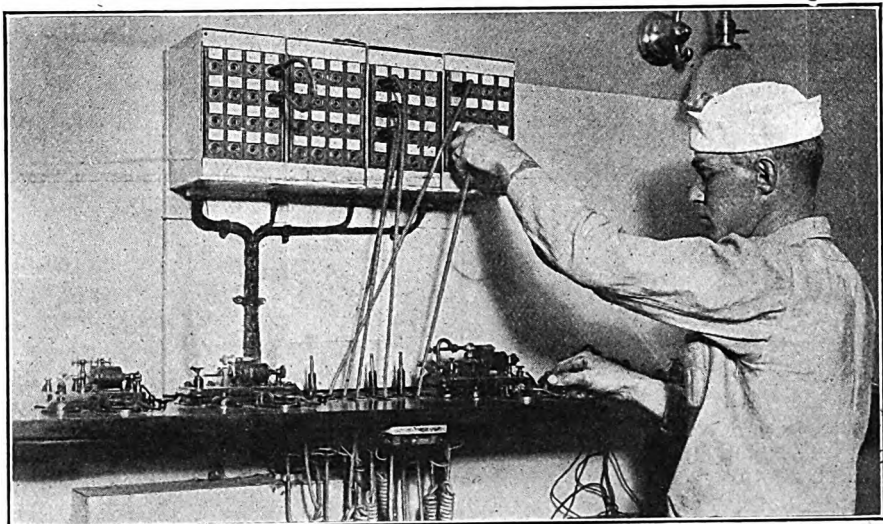
the 75th meridian during the noon period.

This task is of vast importance. While expert observers are at their stations to send forth these signals, captains of all vessels equipped with radio are standing by with their chronometers for a check with the time tick from Arlington. Time represents a large factor in navigation. One error is liable to result in disaster; so it may be realized how important the tick really is.

In the event of a breakdown, which may be of a serious nature, arrangements are made so that the time tick is sent through every naval station using

this so-called remote control, as the lower right-hand picture shows.

After the time tick is finished, the control operator transmits the various weather reports of the different localities along with storm warnings and "dangers" to navigation. This valuable information is issued to all navigators equipped with radio, and has proven itself of great importance. Besides the above, messages of importance are sent to vessels, which may be out of communication from shore stations, in case Uncle Sam has news to be broadcasted, and, at all times, it is available for transmission to outlying stations and the Atlantic fleet.



(c. Underwood & Underwood)

How the sensitive beats from the Naval observatory clock at Washington are relayed through various delicate instruments to the giant transmitter at Arlington. Chief Weyand is connecting up the relay to send out time signals from the Radio Naval Station.

The Radio Primer

A. B. C. of Radio for the Beginner Who Must Have all Primary Facts Put Plainly and Accurately, and all Terms Fully Explained

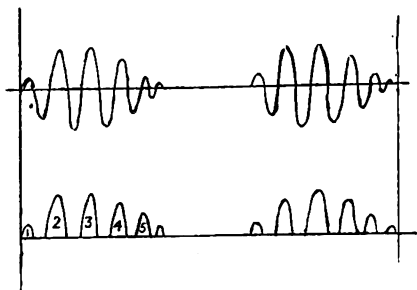
The Beginner's Catechism

By Edward Linwood

IF the frequency of incoming waves is 830,000 a second, and the detector eliminates one half of them, the frequency is still far too high for the ear to hear. How is it reduced?

After the detector has eliminated one half of each wave, it has done all that it can do. The remainder of the action must be carried out by the telephone receivers.

Every time an operator at the transmitting station presses the telegraph key, a series of little sparks jump a gap and travel to the antenna. To a listener it sounds as if the spark were



Figures 1 and 2, respectively, show the radio impulses as they arrive at the detector in trains. No. 2 shows the same impulses after passing through the detector. One half of the waves have been discarded by the rectifying action of the crystal.

a single one, but it is really made up of hundreds of little sparks that start without much power and gradually grow to their highest power then decrease to zero again. If we had a pen that could move fast enough it would trace a series of curves, such as in Figure 1. It is the sparks that leave the gap and pass up the aerial wire and down to the ground connection. In general, the spark impulse can be considered as having the same form until it strikes the receiving antenna passes down through to the tuning coil, thence to the detector.

What happens to this wave when it meets the detector?

As described in a previous answer the detector refuses to pass the entire

The Radio Primer has been published regularly in **RADIO WORLD** since issue No 1, and will be a regular department in order to instruct and aid the many thousands of amateurs who are joining the ranks of radio enthusiasts every week.

wave. It will, however, allow one half to pass through. After going through the condenser, the wave has the form shown in Figure 2.

Will these waves make sound in the phones?

No; because they are still travelling too frequently. They must be slowed down many more times before the little diaphragm in the phones will transmit their message to the ear.

How is this done?

This is really done through the mechanical construction of the phone. In Figure 2 the little waves have been marked 1, 2, 3, 4, 5, 6. If we assume that the diaphragm is not moving when these waves strike it, then wave 1 will draw it down toward the magnet through whose winding the waves are passing. But the diaphragm is a sluggish creature; it hates to start working. So wave 1 barely moves it. By this time, though wave 2 has come along, and before the diaphragm has had a chance to return to its normal position, it is given another yank downward. It always gets there in the end, but its laziness makes it hang behind the waves.

Just as it gets ready to spring back to its position of rest another wave glides through the magnets and gives it another pull.

As a result, the motion of the magnet is something like Figure 3. Thus, while we have been describing it, a whole train of waves has passed but the diaphragm of the phone has made but one movement. When the series of waves ceases, the diaphragm will return to its first position where it will wait for the next train of waves. The sluggishness of phones will vary, but the most sensitive of them cannot begin to travel as fast as the waves. Perhaps there are 200 little wave-im-

pulses to each set of waves. Our frequency, then, which started from the sending station as 830,000 a second, was cut in half to 415,000 by the action of the phone diaphragm. This frequency is well within the range that can be heard by the human ear, and, as a result, we can now listen to the message sent into the air many miles away.

If it is so difficult to move the diaphragm in the phones, why is not some other instrument, such as an ammeter, used?

An ammeter would be less suitable than the phones. The little needle on these meters would take so long to indicate the wave, and so long to return to their first position, that there would be no way of knowing whether the signal being received was a dash or a dot.

Sometimes a small condenser is used between the tips of the phone cords. What is this for?

The fixed condenser at the phones is used principally to improve the tone of the incoming signals.

How can a fixed condenser improve the tone if the phone diaphragm is already moving in agreement with the impulses?

If you look at Figure 3, you will notice that between each wave there is a space during which nothing happens. The phone is not vibrating

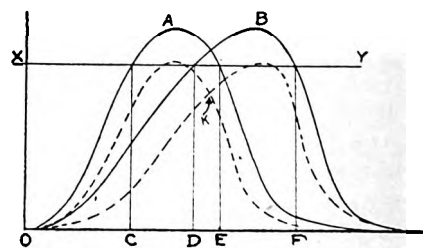


Figure 3—Tight coupling is represented by the heavy lines, loose coupling by the dotted lines.

because there is no current flowing through the circuit. A condenser makes it possible to fill up these dead spots with the impulse it has stored up. When this happens, the tendency of the diaphragm to return to its first position is overcome and the note of the signal is even and clearer.

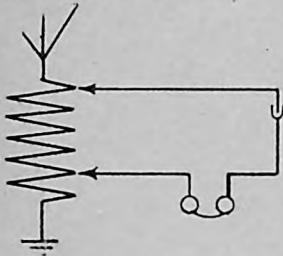
The Radio Primer (*Continued*)

Tuning and What Is Meant By It

By *E. L. Bragdon*

AFTER the detector circuit of the receiving set has been tuned to resonance, as described in my article in RADIO WORLD No. 6, dated May 6, it may happen that several other stations are also sending messages making it impossible to distinguish the station with which it is desired to maintain communication. In that event, it becomes necessary to employ some means that will filter out the offending impulses without destroying those we wish to hear. This can be done in most instances by selective tuning.

Suppose, as an example, that two transmitting stations are sending out waves with slightly different forms as in Figure 2. The frequency of the waves are the same; that is, they start at the same time and return to zero simultaneously. But one of them rises to its maximum value quicker than the other. By taking advantage



Stand-by radio circuit making use of the principle of broad tuning. Drawn By E. L. Bragdon.

of this fact, it is possible to eliminate either one of the conflicting waves.

It will be necessary to further assume that the telephone receivers which are being used, require a flow of current with a value equal to the distance OX and corresponding to the line XY. A simple interpretation of these curves and lines means this: that if our receiving circuit is tuned to the frequencies between O and C we would hear neither station. If the circuit were tuned to frequencies between C and E, we would be able to hear the station sending out wave A; while if a further change in tuning accommodated frequencies between D and F we could hear only the station sending out wave B. But, if through carelessness, or any one of a number of other reasons, we happened to arrange our loose coupler secondary and our variable condenser so that the circuit containing them was in

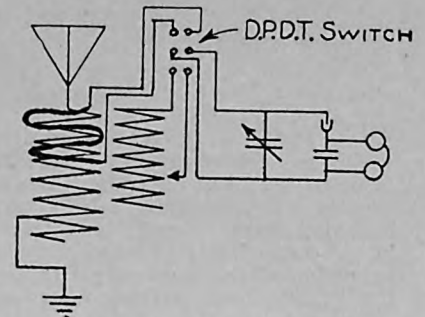
resonance at frequencies E and D, we would hear both stations in proportion to their power and distance.

It would seem at first glance, then, to be impossible to tune out one station or the other so long as their wave forms were similar to those indicated in the drawing and as long as our phones refused to increase their sensitiveness. But because of the characteristics of the loose coupler this selection of stations is made readily.

When a circuit is coupled loosely to another, the effect is the same as if the transmitting station were carried further away from the receiving station or vice versa. The amount of current induced in the receiving circuit will be reduced, and although the wave forms will be the same their peaks, or maximum points, will not be as high. This is indicated in the drawing by the dotted lines. It will be noticed from the drawing, that when the resonance has been gained at a slight sacrifice in induced currents, the current line required to operate the phones has not been changed and is, therefore, nearer the peaks of the curves. But between the points E and D, where formerly there was only interference there is now a point K where the waves do not clash. Thus by merely loosening the coupling between the tuners it has been possible to find a spot where reception may be carried on without interference from stations working on the same wave length. This is why all text books and other instruction guides suggest to the beginner that, as soon as he has heard the station he wishes to "listen-in on," he should pull out the secondary of his loose coupler until the interfering stations have either been eliminated or greatly reduced in their intensity.

As may be seen readily, a receiving station should not be sharply tuned if the operator is desirous of listening in to the general run of aerial conversation. With his set loosely coupled, he might listen all evening without hearing more than a station or two which happened to be attuned to his particular style of coupling. When he is reaching out looking for action, he wants his receiving circuits as broadly tuned as it is possible to make it. He can then make selection of a station and proceed to tune

inset to resonance for that particular wave. The receiving circuit used for broad tuning is called a "stand by" or "pick up" circuit. There are many methods of attaining the same end and only a few will be mentioned here.



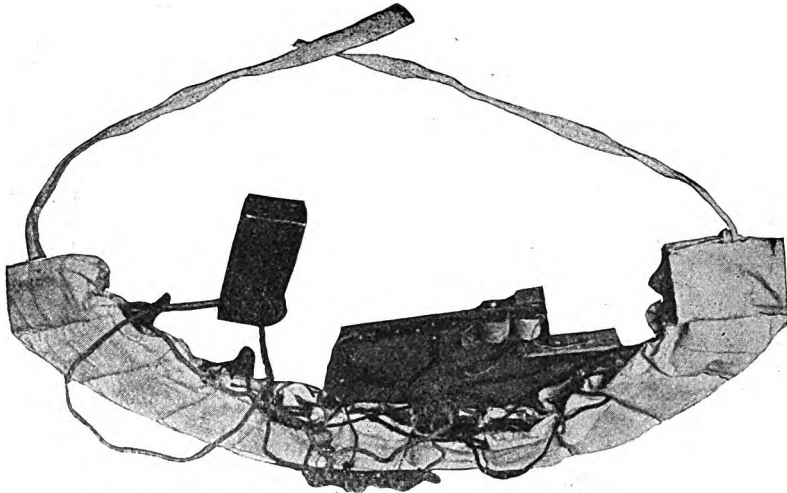
The loose coupler and primary includes an extra coil of wire which embodies the pick-up circuit. Drawn By E. L. Bragdon.

Probably the simplest stand by circuit is the one published in RADIO WORLD No. 6, dated May 6, which consists of a simple single-slide tuner, a detector, and a phone.

The second circuit is a double or triple slide-tuner with the detector and phones in series around the coil. Although connected to the tuner, the detector circuit is really a secondary circuit and the waves induced in the aerial can pass through the inductance to the ground without encountering the high resistance.

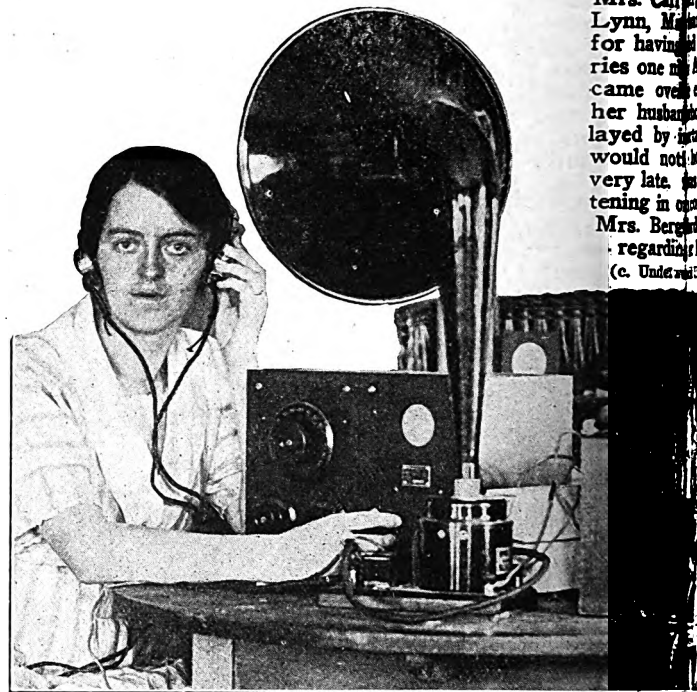
The third "pick up" circuit would consist of a loose coupler which has been tightly coupled. The secondary coil would be inserted into the primary until the windings on each correspond. In the United States Navy this same effect is obtained by the simple scheme of winding several turns of wire around the primary coil and connecting the ends to a switch. The same switch is also connected to the terminals of the loose coupler and, also, to the detector circuit. By throwing the switch in one direction, the operator may listen in on a broadly tuned circuit to the general conversation passing about him; but if he is called by a station or wishes to listen to a particular ship he needs only to throw the switch in the other direction. This connects his detector circuit instantly with the loosely coupled regular receiver. The advantage of this layout is obvious.

Newsy Photographs of the Week Show

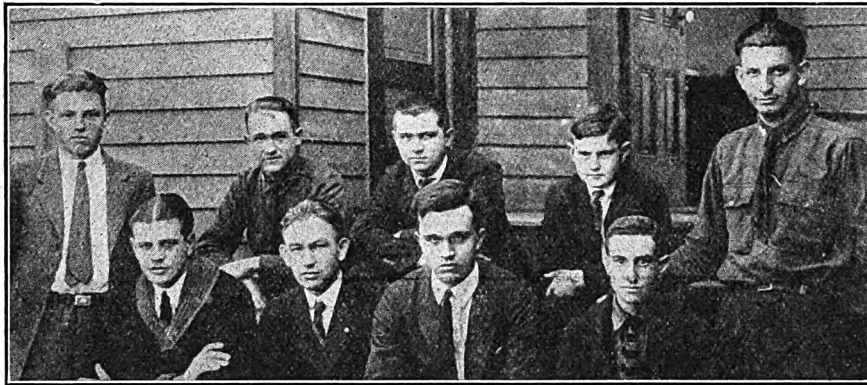


"Close up" of a cleverly designed wireless belt. This apparatus, which was recently seized by the San Francisco police, is intended to be worn around the waist. The device consists of a pocket radio-system to be carried concealed in a coat pocket, a belt of high-power batteries strung around the waist, connected with a mute telegraph-key buzzer. It is claimed that it will flash by radio waves secret information of the business marts to a central station. It was used for listening in on advance information regarding the stock market.

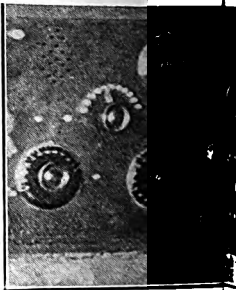
(c. Keystone View Co.)



Mrs. Carolyn Lynn, mother of a child, is shown for having received one of the new radio sets. She came over to her husband's office and would not be very late in listening in on Mrs. Berg's regarding (c. Underwood & Underwood)



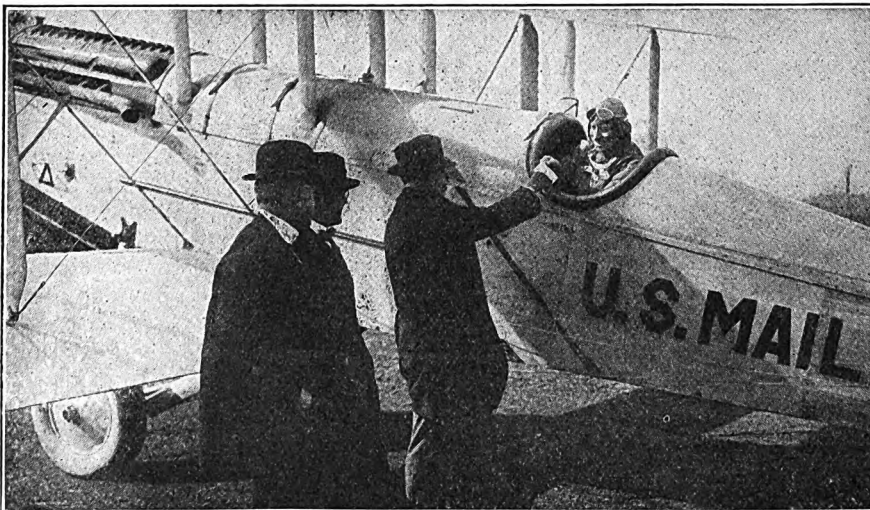
(Left) Radio operators of the Auburn Polytechnic Institute, Alabama, considered one of the largest amateur stations in the Southeastern United States. Top row, (left to right, sitting:) Thomas Neely, T. G. O'Connor and Arthur Dunstan. Bottom row (standing, left end:) J. C. Dickinson. Seated: V. C. Ilvaine chief operator; H. S. Brownell, F. W. Breedlove. Extreme right (standing:) J. C. Bailey. (c. Kadel & Herbert News Service)



"Close up" of a radio set, with attractive design. It was found that it brought in a lot of business. It rested on a table (c. Underwood & Underwood)

(Below) E. H. Lee, pilot of the United States Air-Mail Service, who made a record "run from Chicago to Washington in six hours and two minutes, all the time keeping in touch with the head of the Air-Mail Service, in Washington, by means of a radiophone which will be installed in the air-mail planes for signalling purposes. Pilot Lee is handing a letter to Post Master General Work, just after his record-breaking trip. John H. Bartlett and Paul Henderson, First and Second Postmasters General, are also present.

(c. Underwood & Underwood)

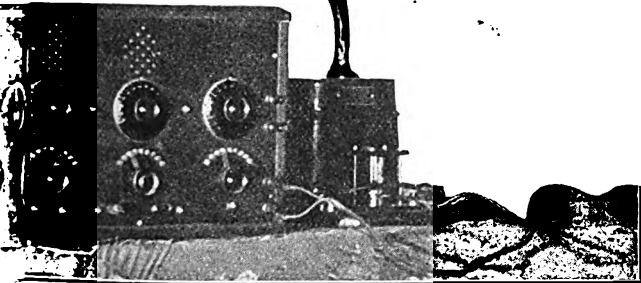
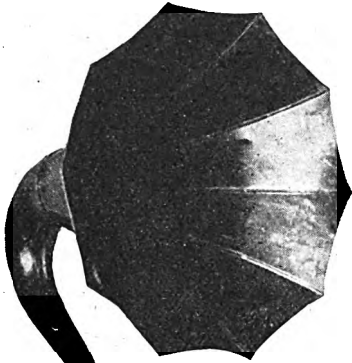
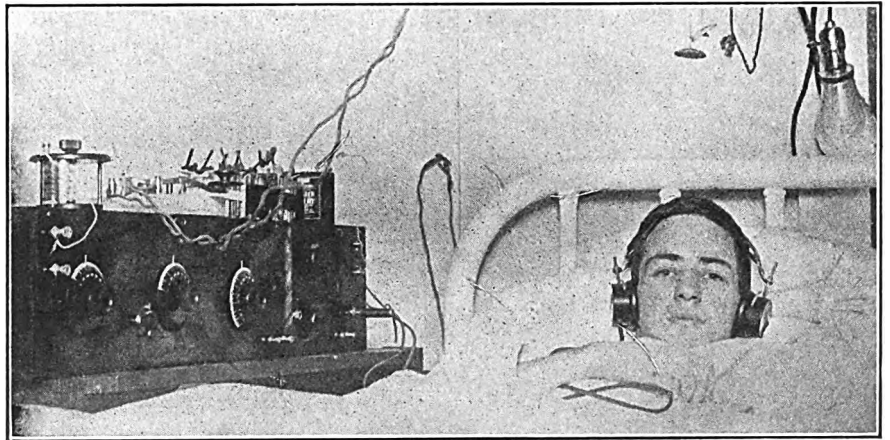


Radio Used in New and Diversified Ways

Berg, of East
thinks radio
led her wor-
A message
either that
who was de-
ortant work,
home until
was while lis-
concert that
ard the news
er husband.
(c. Underwood & Underwood)

(Right) perhaps this is the first
you have heard of 6AJH, San
Diego, California, or understand
how much radio means to him. It
is practically his life. He is Les-
ter Picker, 16 years old, and he
would have been graduated from
High School this June had he not
fallen and suffered a broken back
while erecting his radio aerial.

(c. Underwood & Underwood)



ceiving-set for use in a parlor or bedroom. This particu-
loud-speaker, was photographed in the boudoir of a lady
ght her much surcease after she had retired for the night
ar her bed, and was tinted to harmonize with the room.
(c. Kadel & Herbert News Service)

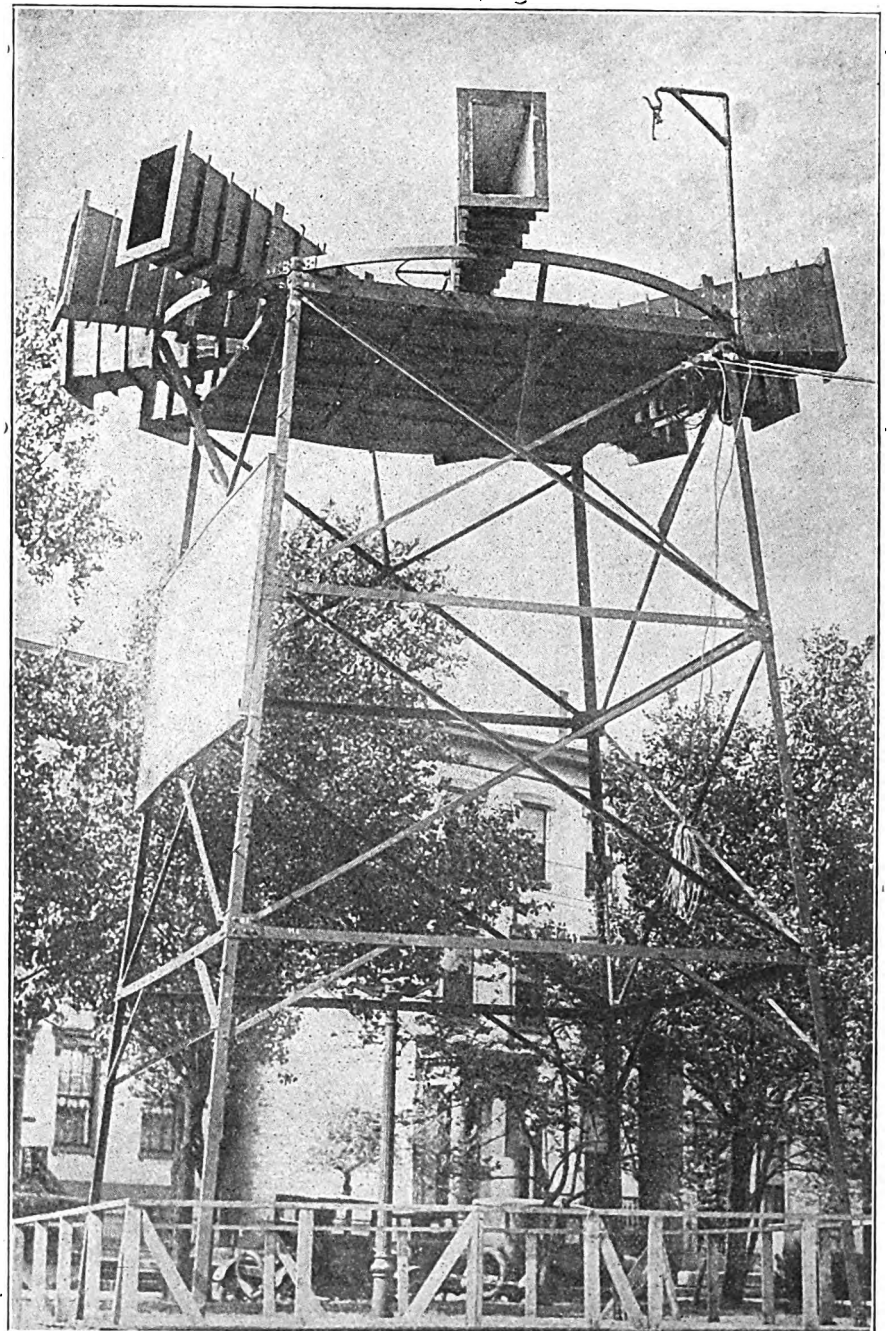


(Right) This gigantic am-
plifier, the largest and
most powerful ever con-
structed, was erected in
Lytle Park, Cincinnati, to
enable President Harding's
address during the Grant
Centenary Celebration to
be heard clearly by thou-
sands who were present.

(c. International Newsreel)

(Left) Corp. C. Thompson,
U. S. A., is proudly ex-
hibiting the latest thing in
"parlor aerals." It is in
the form of a lyre, and
was designed by Quar-
ter-master-sergeant G. M. Du-
senberry, Signal Corps, U.
S. A., at the Fort Wood,
N. Y., wireless laboratory.

(c. Underwood & Underwood)



Radio and the Woman

Latest Gossip About the Feminine Enthusiasts

IN a certain southern town, a trained nurse who believes in combining efficiency with expediency, receives reports of the physical progress of one of her patients, through her receiving set. Each morning and night, she tunes up her instrument with even less effort than ever she used in opening her medical case.

* * *

That radio is a subject which occupies the scientific minds of thousands of women who, for years, have made it a business and study, is, of course, a well-known fact; but that it is a topic of almost equal interest to women writers in this country is revealed by a notice at hand which states that, at a future meeting of the League of American Penwomen, a receiving set made by one of its mem-

bers is to be displayed and the technical side of radio thoroughly discussed.

* * *

A woman who has devoted many years to the study and practice of wireless, states that soon it will be possible to see as well as hear by means of radio transmission. Her authoritative opinion is that when we talk to another at a great distance, we shall be enabled to see our listener's face.

* * *

A friend who possesses a handsome "chow" dog says that when she adjusts the head-set on the animal he appears to enjoy the program he hears quite as much as she does when she listens in.

* * *

When I hear complaints that radio broadcasting permits of no secrecy, I always feel like asking what assurance any one has that their conversations are not overheard on telephone or that confidences are not shared when voiced otherwise than over a sending set.

* * *

Air, you know, is no less a practical means of communication than wire, and it is a limited mind that does not grasp the fact that there is nothing mysterious about radio. It's the newness and greatness of the thing that puzzles people.

* * *

It is to be devoutly hoped that the wedding ceremony which took place in an airplane, 5,000 feet above Times Square, the bridegroom did not drop the wedding ring just previous to partaking of the nuptial kiss sent broadcast and heard by thousands of radio fans.

* * *

The outer portals of a house of prayer on St. Nicholas Avenue, New York City, bears the sign, "Chapel Radio Services Here."

* * *

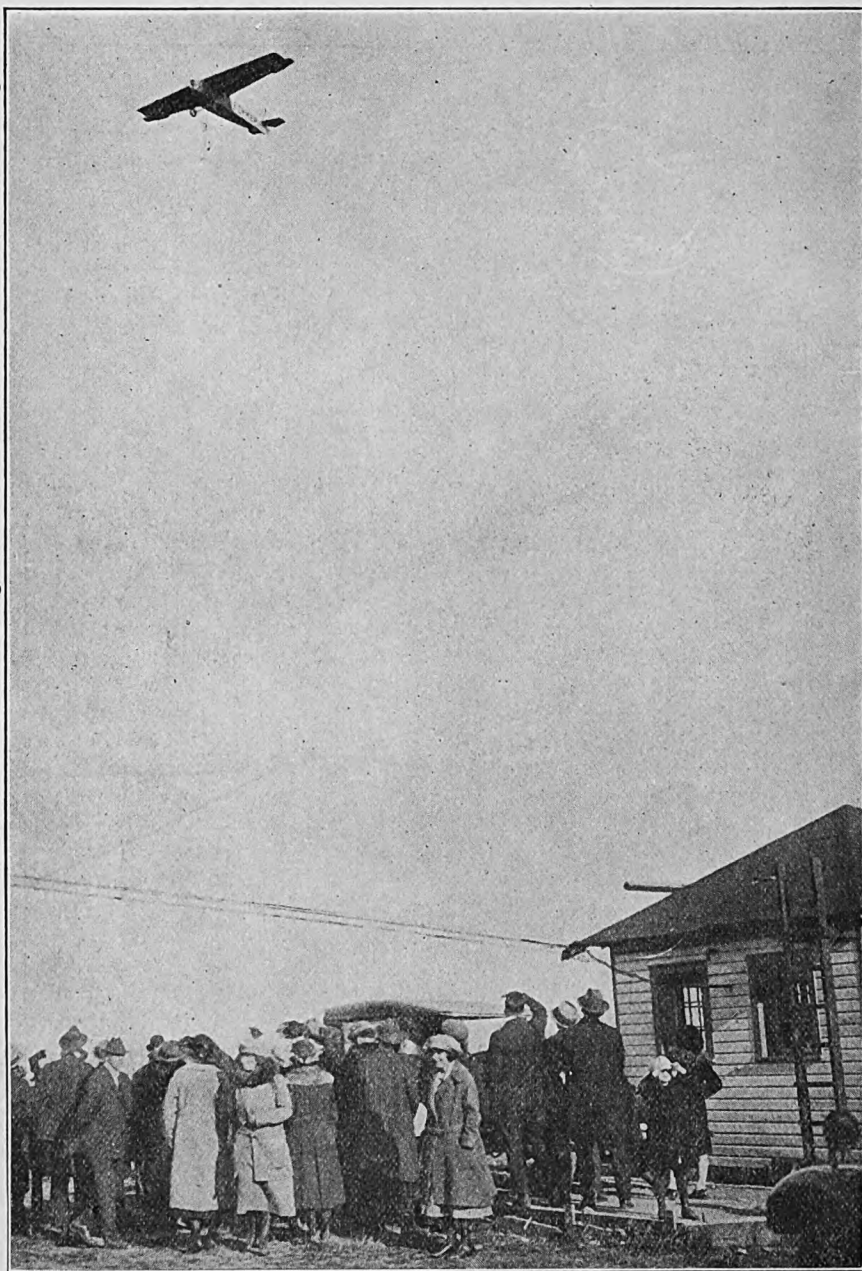
Three words which are spelled quite differently, but which have the same meaning, formed the basis of a recent argument.

My English friend claimed that "amplifier" is the correct term to use when referring to the tube that increases voltage, whereat a petite French miss spelled, and pronounced it, "amplificateur."

My more snappy American word, "magnifier," for the moment offended their foreign sensibilities.

* * *

An amateur fan writes that, on different occasions she hears at least two wireless stations broadcasting. She judges from this that the artists on respective programmes must enjoy dispensing good entertainment quite



(c. Underwood & Underwood)

Curtis Field, Mineola, Long Island, on the sunny afternoon of April 22, when Rev. Belvin W. Maynard, known as the "flying parson," performed an aerial wedding in the Fokker machine toward which the people in the photograph are gazing. The groom was Albert P. Schlafke, athletic director of the Veterans' Mountain Camp; and the bride, Sarah Cockefair, a Brooklyn nurse. In the Fokker, besides the parson and the interested couple, were little Mary Louise Cobb, flower girl; Bert Acosta, pilot, and a radio operator. The spectators heard the marriage ceremony. It was transmitted by radio.

as much as those who listen in, enjoy hearing it. Well, maybe they do.

* * *

"A landlord so unprogressive as to prohibit aerals on the roof, can't have me for a tenant!" exclaimed a spirited woman friend following an interview with the apartment house owner referred to, "for if he's as unenterprising as that, he'd probably be equally backward in other improvements!"

* * *

An anxious husband writes to ask if his wife's acquired knowledge of radio means that the purchase price of wrap or gown with which she might become enamored while on some future shopping tour, could be guaranteed by identification of his voice over the costumer's radiophone. I'm sure many of us haven't considered wireless from this angle, but maybe it isn't too much to say that it is something that will be established in the future.

* * *

Very recently our dark-eyed Cuban neighbors danced to music broadcasted from Schenectady, New York, a distance of 1,455 miles.

* * *

I'll wager that one self-sacrificing little mother did without a new Easter hat, so that her children might have their receiving set.

* * *

To the girl who drives her own car, a flat tire holds no terrors if her machine is equipped with a sending set.

* * *

The fact that, before long, another big wireless station will begin operations in New York City, suggests that sooner or later, representatives of broadcasting stations will be obliged to get together and arrange a definite program. It is hardly likely that such a meeting will lack a woman's suggestion regarding the future entertainment of American homes.

* * *

A New England housewife proudly states that the new radio broadcasting station at Hartford, Connecticut, will be completed shortly

* * *

"When radiophones are installed in subways, will the wireless announcement, 'Gentlemen, rise and give the ladies your seats,' secure us the advantage of comfort?" I am asked.

* * *

Mothers of girls of high-school age should have been particularly interested in Dr. W. Burnham's talk on the advantages and special features of the co-operative High School, which was broadcasted from Wanamaker's.—Rose R. G.



(c. Photograms, N. Y.)

This is possible. There are no aerals to show that baby is hearing anything; but radio is advancing so rapidly that the day will come when little ones will be entertained during their outings.



(c. International)

Alice Daly is only a girl, but she is one of the crack amateur radio operators of the Pacific Coast. She learned the code from her father who was a telegraph operator in India.

The Good Radio Is Doing the Country

By Henry F. Vortkamp

President, National Motor Accessories Corporation

MANY people seem to think that the radio receiving-sets were created only recently because they came into such prominence on such short notice. The truth of the matter is that the inventors have had receiving sets for some time, but they did not become the profitable commercial proposition they are today, due to the fact that the great broadcasting stations were not in existence, and, consequently, there was no music to be had from the air. However, the large electrical companies found that they could commercialize receiving sets by erecting their own broadcasting stations, with the permission of the government. This was done. The result is that millions, today, are hearing music, and the daily companies are selling their sets in vast quantities.

As president of the National Motor Accessories Corporation, it has been my good fortune to feel the pulse of the entire country. Our dealers, in every part of the United States, are sending in information constantly, so that all the tricks of the trade are brought to my notice. Also, the progress of radio and the mistakes made. With my sources of information, I am sure I am in a position to give the public facts as they really exist.

It would surprise the people to know that most every boy from twelve years old, is making his own set. The parts they are buying; and they are constructing the best they know how. They do hear Morse code, but are not clearly successful in getting the music. However, there are some here and there who are the exception to the rule. Therefore, the demand for radio parts has far outreached the supply. Each and every one of these boys will purchase completed crystal-sets after he tires of his makeshifts.

The crystal sets need no batteries or dry cells or tubes, yet they give a very clear and distinct tone to the voice or music from the city broadcasting stations. After they have had the crystal sets they yearn to have the tube sets because, as boys, they want to hear Pittsburgh and other distant points. However, they find that the application of electricity to the receiving sets gives them louder music and louder talking; but it has not that healthy human sound that is produced by the crystal sets. Yet the tube sets are convenient, due to the fact that

you can hear from points of a great distance.

It is wonderful to note the progress of the radio all over the country. It gives the mind the picture of a wave going farther inland, covering more territory until it has covered all. First it started in New York, then Pittsburgh was reached—Newark being the New York station—then Detroit, then Chicago, then Denver, and, finally, San Francisco. It is gradually spreading over the Southwest and Southeast. Broadcasting stations are shooting up here and there. This in itself means an enormous number of people added to the radio army of receivers. Each one must have a set. The factories must supply them all, but they cannot. The natural result is that prices on parts and sets will rise for some time until the factories catch up with the demand. This has given employment to a large body of men and women. While the financial depression has hit most every other line of business, thousands rushed pell mell into the radio business. Some will lose ultimately, but it is an assured fact that most all will prosper.

It appears that the best move on a prospective radio-set purchaser is that he purchase a crystal set and learn all the rudiments of radio, generally speaking. Then he should purchase the larger sets, such as tube sets. If he does not, he will be burning out his storage battery and dry cells, blowing out his tubes, which is surely very costly and does chill the enthusiasm of the radio fan. The radio fans who purchase the large sets, or distance sets, are like the child who sees a big piece of cake, and tries to get the whole piece down its throat at once.

Everything must be done gradually.

Transmitting Is Costly

RADIOTELEPHONE stations that transmit the various concerts, are very expensive to conduct, owing to their complicated apparatus. The power input ranges from 50 watts to 1,500 watts, but their range is not proportionate to the power input. It is known in radio circles that some broadcasting stations have an unusually wide range from 1,000 to 2,000 miles. The latter distance is extremely long.

You will hear many people say that the crystal sets are obsolete. You can be sure that after the public has had all its trouble with the larger sets they are going to use the crystal sets because the crystal sets use neither dry cells or batteries. No electricity. Simply hitch your sets to the aerial, turn the knob on the dial and you have the music for the rest of the day. If the voice or music is dim, then simply keep touching the wire on your crystal detector until you find a sensitive spot, which makes the voice louder.

Stay there! I have heard many amateurs say that they heard Pittsburgh and many other points on their crystal sets. This is almost impossible except when you happen to have the most ideal atmospheric conditions. I personally have heard Pittsburgh on a crystal set, and it was distinct and plain; but it seemed at a great distance although I understood each word spoken. The program in Pittsburgh did check up with the concert as heard by me on that night; but that is so seldom that it is best not to give the matter much consideration. However, the concerts at Newark surely are the best in the land, and why should one wish to go to Pittsburgh for music of less quality. If you can hear the music so plainly and pleasingly on a crystal set, why use the larger sets which have so many technical conditions? It is my opinion that the "city sets," namely crystal sets, will be in far greater prominence and in greater demand a year from now than they are to-day.

Many improvements are being held in abeyance by manufacturers of radio sets, which will assist materially in making radio still more desirable to have in the home. The factories are not wasting a minute along these lines.

The sudden advancement of radio, commercially, has caused money to be put in circulation, besides it has employed people who were on their last legs. The money it has circulated has helped prosperity to return. Because of radio everyone has caught the spirit of the times, and instead of that constant "hang-dog" look, that remark, "Things are bad," we have smiling people who are looking forward to years of happiness. Radio has made our country feel its power, and, past assured, in time it will be more powerful.

Forget the Flash of Lightning

By Thomas J. McElroy, Jr.

RADIO, to-day, is getting more free publicity than was ever given to any other industry or art. Newspapers and magazines, all over the country, have installed radio sections or columns which have taken the utmost attention of their readers. Editorially and otherwise, radio is being written or talked about to such an extent that even the World War now seems to be but a flash in the pan.

However, although well-known writers are doing a wonderful amount of good towards educating the public in the art of radio, there is still one thing that many have overlooked: signifying radio by a flash of lightning.

Wherever we look, whether a magazine advertisement, a newspaper heading—as a matter of fact, wherever radio is pictured, we see the same old detrimental flash of lightning.

Those of us who were acquainted with wireless before the days of broadcasting, know very well that radio does not travel through the ether as does a lightning flash. But it seems that the new men in the field, both advertisers and editors, are under the false impression that the flash so often pictured has a tendency to put life into the article or "ad" about radio. This is entirely

and woefully the wrong view to take. On the contrary, instead of boosting radio, it does unestimated harm to the industry so far as the layman is concerned. The first thought of a new owner of a radio receiving-set is safety to himself and home. He wonders if this brand new household contrivance will give him an electric shock—whether it will shoot forth a flash in the middle of the night and do harm to himself and home. If we are to take that main and important fear from his mind, we surely cannot do so by constantly putting before his eyes such a danger signal as a lightning flash.

The word, "Radio," at this time is in, itself, sufficient indication of what it implies. We don't need to put the old death sign of a flash alongside it. All of us are trying, in our respective way, to do all the good possible for radio and in no other way can we do it until we first cease to do it harm. Let us then, if we desire to tie up art work with the running head of our "ad"—let us use other means of attracting attention of the reader. There are innumerable other ways of using this necessary art work so it will build up radio instead of knocking it down. The only way we can accomplish it is by country-wide co-operation. Let's start now!

Radiogleanings

BECAUSE Yosemite Valley, California, is—as certain writers have expressed it—merely a "hole in the ground," some wireless experts were entirely against the successful operation of a station there. Though Yosemite's granite cliffs rise 5,000 feet in the air, broadcasting has been heard distinctly from aërials strung from two giant trees on the Valley's "floor."

The University of Wisconsin announces a course in radio. Lessons will go by air route to residents of the Middle West.

The Rock Island Railroad is the latest to announce that it will install radio for the benefit of passengers.

Wave length for broadcasting entertainment is 360 meters. Daily weather, market and crop reports and other official and semi-official announcements are sent out on a wave length of 485 meters.

There are now, in the United States, 71 licensed broadcasting stations, of which 7 are department stores. Of the 7, Philadelphia is the location of 3; New York of 1; Newark, N. J., of 1; St. Louis of 1 and Los Angeles of 1.

Although the transatlantic radio service of the Radio Corporation of America has been in existence only two years, it handles

approximately one-fifth of the total traffic passing between America and Europe, and an even greater proportion of the trans-pacific traffic.

Forty-eight hours after a description of a youth who fraudulently obtained two wireless sets from Pittsburgh electrical houses was broadcasted, relatives of the fugitive went to Pittsburgh and paid for the instruments. It was estimated that more than 10,000 amateur operators received the call.

The first American steamship to be equipped with a radio telegraph station was the Philadelphia, in 1902.

Concerts broadcasted in Newark, N. J., have been heard plainly by amateurs in Cleveland, Ohio.

Edward T. Stotesbury, head of the banking firm of Drexel & Co., Philadelphia, has had a "set" placed in his new palatial home near Chestnut Hill.

"Here's How!"

The radio creates a new world. It's a wonderful invention. Think of the joy of being able to connect up with Cuba and hear our friends drink!—*Evening Telegram*, New York.

Old Windmill Becomes an Aerial Tower



(c. Kael & Herbert News Service)

The radio craze which has been spreading across the American continent has not stopped, but carried itself, by radio, across the Atlantic. The accompanying photograph shows how radio is becoming popular in England. An elementary school, at Haslemere, England, has, probably, one of the most up-to-date wireless and radio equipment sets in Great Britain. Rather than build an aerial, the boys of the radio class converted an old windmill with great success.

Keep Your File of Radio World Complete

If you did not get the first six issues of **RADIO WORLD**, you can get them through the American News Co. and its branches, or send 15 cents per copy to **RADIO WORLD CO.**, 1493 Broadway, New York, N. Y. (Adv.)

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While every possible care is taken to state correctly matters of fact and opinion in technical and general writings covering the radio field, and every line printed is gone over with a scrupulous regard for the facts, the publisher hereby disclaims any responsibility for statements regarding questions of patents, priority of claims, the proper working out of technical problems, or other matters that may be printed in good faith and on information furnished by those supposed to be trustworthy. This statement is made in good faith and to save time and controversy over matters which the publisher cannot possibly have control.

Dampness Essential to Ground Plate

AS the ground is fully as important as the aerial system, care should be taken in making one, says the Springfield, Mass., "Union." The first thing that is necessary is a good-sized piece of sheet copper. This should be at least 18 inches square, and more if possible. Look around the yard and pick out a spot where the ground is most apt to remain damp and dig a hole there. This hole should be from 3 to 4 feet deep in order to have the ground retain its dampness during a dry season. In order to make the ground hold its moisture better, it is sometimes a good plan to dump a bag of charcoal into the hole so that it is packed about the copper plate. Charcoal has the property of holding moisture very well. After it is in place, pour a couple of buckets of water over it. Fill in the ground again and pack it down tight. Be sure that you have a good heavy copper wire soldered to the plate before it is buried; or, better yet, solder a length of copper tubing such as is used for the gasoline lines of an automobile.

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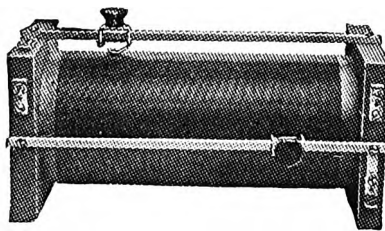
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Answers to Readers

I AM informed that I should use No. 4 wire from my lightning switch to the ground. Why should this wire be larger than the lead-in? Is it all right to connect this wire on the outside of the water meter. If this wire cannot be connected to a water pipe outside the house, is it safe to run it through the wall into the cellar or could I bury a metal rod and connect my lightning wire to this?—C. M. P., Philadelphia.

According to the rules of the National Board of Fire Underwriters, your ground wire must have a three-quarter inch periphery for lightning protection. The best way to protect your set is to use a lightning arrester which will pass the Board of Underwriters requirements. Never connect your lightning ground to the house side of the meter. If you cannot connect to the street side, then use a driven ground-rod which will be much safer.

Can I receive concerts with an aerial 20 feet long, two stories above the ground? The aerial will be closed in by a number of buildings.—H. M. Weehawken, N. J.

You can receive concerts, but you will either have to enlarge the aerial or you will need an elaborate set with the small aerial.

Which is the most efficient for loose couplers, the slider or the units and tens system?—P. E. C., Brooklyn, N. Y.

The efficiency of a loose coupler depends on the care used in its construction. Either the tens or unit system of tapping or the slider will give a single-turn adjustment and will work equally well.

We are in the market for a high-class receiver. As we have no experience, we would like your advice as to the best? What is a good book on this subject?—M. J. H., Washington.

No particular set can be suggested here. We advise you to purchase a good regenerative vacuum-tube outfit as this will meet with all of your requirements. Your local dealer, no doubt, has various books pertaining to radio.

I have a short-wave regenerative set and a terrible amount of static. Would a longer aerial, much higher, eliminate much of this static?—R. M., Rochester, Ind.

By inserting a variable condenser in shunt to the primary winding of your variocoupler, or loose coupler, may cut down some of this static; but getting higher into the breeze creates much more static. As this is the season for static, only by proper tuning can some of it be eliminated.

Is it necessary to obtain a license to erect an aerial for receiving purposes only?—K. L., New York City.

No license is necessary for the above. If transmitting is attempted, a license must be taken out.

Where are the following stations located? WOR, NOF, WWZ?—D. S., Coney Island, N. Y.

WOR—Bamberger's station at Newark, N. J. NOF—government station, Anacostia, D. C. WWZ—Wanamaker's, N. Y.

Where can I get information regarding a good circuit for a radiophone set?—J. P., Manchester, Conn.

Owing to the large numbers of questions received from readers it is impossible to answer all in this number. Your replies will appear in the next or future numbers of Radio World.

RADIO WORLD publishes weekly the various circuits and hook-ups. This is the only practical suggestion we can give you.

How can I tune out a local broadcasting station situated within two blocks of my set? I am using a Clapp-Eastham, with two stages of amplification; but, somehow, I am unable to tune in for any other station while the local station is broadcasting. Is there a remedy?—F. F. F., Charlotte, N. C.

You do not explain your question fully especially regarding wave lengths. It is a sure gamble that you will be unable to tune him out, as he is so close that forced induction is made possible. No doubt some of his signal strength could be reduced by inserting what is termed a trap; but, in the long run, the strength from this broadcasting station would interfere regardless of the finest tuning—just enough to spoil any other program going on.

I am building a regenerative vacuum-tube receiving set. In order to keep my storage battery properly charged, I must carry it, on a street car, to the heart of the city, which is bad business. Why can't I use four gravity-cells, commonly called "crow-foot" cells, such as are used in railroad signalling, telegraphy, and telephoning. I have a limited amount of cash to spend. Advise me what to do.—R. S. W., Cincinnati.

You did not let RADIO WORLD know whether or not you have available electricity in your home. If you have alternating current, we advise you to purchase a home-charger and connect this up to your battery. This would eliminate the trouble of carrying it downtown. Using blue-vitriol batteries would be unwise as they do not possess a large capacity for filament lighting. Stick to the storage. Read carefully the article by George W. May, R. E., in RADIO WORLD, No. 6, dated May 6, page 14.

Tell me of a good book on radio and radiophone building, something that will give complete specifications of prints suitable for an experienced electrician to work from. I do not want one devoted to theory and explaining the elementary principles, but something similar to what would be sent from the engineers to a shop intending to build one.—G. S. M., Salem, Mass.

In issue No. 3 of RADIO WORLD, page 18, is a list, "Books for Amateurs." According to your letter, either "Practical Wireless Telegraphy" by Elmer E. Bucher, or "Design Data for Radio Transmitters and Receivers," by M. B. Sleeper would solve your question.

Is there a school where I can take an evening course in the theory and practice of radiotelephony, other than those classes maintained by the Y. M. C. A., and the K. of C. Is there a course covering this in three months or less?—R. T. C., New York.

Besides the above-mentioned schools are the Radio Institute of America, 98 Worth St., New York City, and the Seaman's

Church Institute, 25 South St., New York City.

How reasonably can I purchase a receiving set that would pick up Washington, D. C., Newark, N. J. and Pittsburgh. I live in a private house and the nearest broadcasting station is 75 miles away.—H. P. J., Philadelphia.

A tube receiver, including a two-step amplifier of the regenerative type, with a good aerial, should prove sufficient for your purpose. Be sure you get a regenerative tube outfit. Prices range from \$100 to \$300.

Is it possible to use a variocoupler in conjunction with a tuning coil in a receiving set (crystal set) If so, is there any advantage using just a tuning coil. My set consists of crystal detector, fixed condenser, and a variable condenser with tuning coil.

Is it possible to use a loud-speaker attachment with a phonograph, or any other kind of loud speaker in conjunction with this set?

Is a two-wire aerial, 100 feet long, as good as a single wire aerial of the same length?—S. W. B., Union Hill, N. J.

You cannot use a variocoupler in conjunction with a tuning coil as both play the same part in a set. You can either use your coupler with your detector or your tuning coil. Try out each and find which gives the best results.

You cannot use any type of loud speaker with a crystal detector. If you wish a loud speaker, such as a magnavox, you will have to get a tube set and a two-stage amplifier.

With this arrangement you can connect up to most any phonograph.

A one-wire aerial, 100 feet long, will answer just as well as a two-wire the same length.

I am using a variocoupler, variometers inplate, grid circuits, vacuum-tube detector, and Murdock 2,000-ohm phones. I have gone over my lead-in, etc., and find that everything is properly insulated; but everytime the telephone rings, I can pick up the receivers and listen to the ordinary telephone conversations. Please suggest a remedy for this trouble, as it interferes with radiotelephony.—H. P., Revnoldsville, Pa.

Carefully look at your antenna. Does it lie in parallel with any telephone line? See that no telephone feed-line runs in back or around your receiver. If a telephone line lies in close proximity to your antenna and ground circuit, it is probable that you are amplifying signals from this feed line.

RADIO WORLD further suggests that you look over your connections carefully for feed telephone-lines. If you locate any, try to run your wires at right angles. Inform us as to results.

Where do I connect a fixed condenser using a crystal detector? Must I use a loose coupler, or can I use a variocoupler?—F. A., New Brunswick, N. J.

The fixed condenser is simply connected into the receiving set in such a way that the head telephones simply bridge the condenser. Either may be used. Would advise you to try out each for efficiency, then use the one that seems most satisfactory.

Letters to the Editor

Would Join Radio Pioneers

Editor, RADIO WORLD: In your issue of April 22, I noticed your article suggesting the organization of a Radio Pioneers' Society, and I believe it would be a fine thing. I am especially interested, because I think I could qualify as a member.

I first became interested in radio in 1903, when I was a country telegraph-operator up in Skowhegan, Maine. In 1904, I enlisted in the Signal Corps, being assigned the Fort H. G. Wright, Fisher's Island, Conn., wireless station where we used a 1 kw. Fessenden set with the liquid barereter-detector and twenty-wire harp antenna. During my enlistment in the Signal Corps, I was promoted to sergeant and operated about all of the makes of sets in existence at that time, including De Forest, Massie, Stone, Clark, Shoemaker, Telefunken and Sloby-Arco.

My next job was with the United Wireless Company in the AX station at Atlantic City, N. J., also on the cable-repair ship, "Relay."

In 1910, I went with the De Forest Company as operator in the Metropolitan Tower station. While there, I operated the receiving instruments for Hudson Maxim and several New York City officials so they could listen to Madame Tetrassini sing over Dr. De Forest's phone-set in the laboratory on Park Avenue. I was also given credit by the New York papers for establishing a world's record for overland transmission when we sent a message direct to Milwaukee, Wis., from the editor of the New York "Herald" to the editor of the Milwaukee "Sentinel."

During the summer of 1910, I was one of the construction engineers installing stations for the Great Lakes Radio Telephone Company, and was just finishing the installation of their Sault Ste. Marie, Michi-

gan, station when they stopped operations completely. After that, I worked for Walter Massie a short time, but finally decided that there was a broader field for me in power-plant work. But I have never been able to get the radio bug out of my system. I am now employed as radio engineer with the Bear Cat Battery Service, Lemoyne, Pennsylvania.

I shall watch your future editions for further information of the Pioneers' Society; and if my qualifications will permit, I want to be on the list of members. —Charles C. Heselton, Bear Cat Battery Service, Lemoyne, Pennsylvania.

Another for Mr. Garrick

Editor RADIO WORLD:

Who is this Ralph Garrick whose wail greets us from the inside cover? Did somebody step on his pet corn badly?

Ralph must take great pleasure in living and I suppose would like a large slice of the ether preserved for his use.

I will admit that I am only a "ham." Six weeks ago, I didn't know that radiotelephony existed except in the experimental stage. To-day I have four different receiving outfits and can read and send code fairly well for a "ham."

Some of the rest of us might ask Mr. Garrick just how the public would benefit by the most meritorious work of the worthy amateur if all broadcasting was eliminated.

Possibly my education and business experience have been so limited that it is I who am taking the narrow-minded view; but if the condition is the reverse, we might suggest that Mr. Garrick go to some other country that is doing more for the amateur than is the United States. A man cannot be wholly selfish in this world. —H. D. Abbott, New York City.

A Bit of Radio Gossip

Editor, RADIO WORLD: ***You were mistaken about it being only thirty minutes that the steamer "America" "talked to land." I heard them talking about two hours. Also, that week—Wednesday, Thursday, and Friday nights—the "America" was talking to land stations, principally QXY.

For a little bit of gossip: A great deal was said about someone on the "America" sending "Ethel," in New York, a kiss. I did not hear that kiss, but I heard a fellow whistle from the ship to land.

And, that time, I heard this man tell "Ethel" what he brought her from Paris. This was the conversation:

"Hello, Ethel!"

"Hello, Charles!"

"Your voice doesn't sound natural, Ethel."

"I have a cold, Charles."

"I have brought you the latest thing in porter, from Paris, Ethel."

"I'll see you in the morning, Charlie."

I wonder which she likes best—wireless kisses or porter from Paris?—Fred Conant Epping, New Hampshire.

He Likes Westinghouse

Editor, RADIO WORLD: I have just been reading the letter from Ralph R. Garrick in RADIO WORLD, No. 4. I must say that I agree with him in all things he says but one, and that is in regard to what he calls "Wonderful Westinghouse."

Well, it is a wonderful receiver. I would like friend Garrick to know that I have copied stations from every district but one—the 7th. The 8th and 9th, he speaks about "roar in" all over the room. I handle traffic with 1, 2, 3, 4, 8, and 9 every night, and have cards to show for it.

I wonder if friend Garrick knows that "ole" IZE uses a "RC" Westinghouse?

Lets hear from other DX men who use the "RC."

I have been interested in the game for seven years, and have had a set since the days of the lil ole galena and loose coupler.—D. B. Fancher, Radio Station, 1 BVB, Westerly, Rhode Island.

Chicago Elevated Roads to Use Radio



(C. Underwood & Underwood)

If the present plans of the Chicago Elevated Railroad do not miscarry, the patient straphangers will gladly pay the present fare. The elevated is figuring on installing a radio system on its lines to furnish passengers with news. The photograph shows a radio equipped train under test.

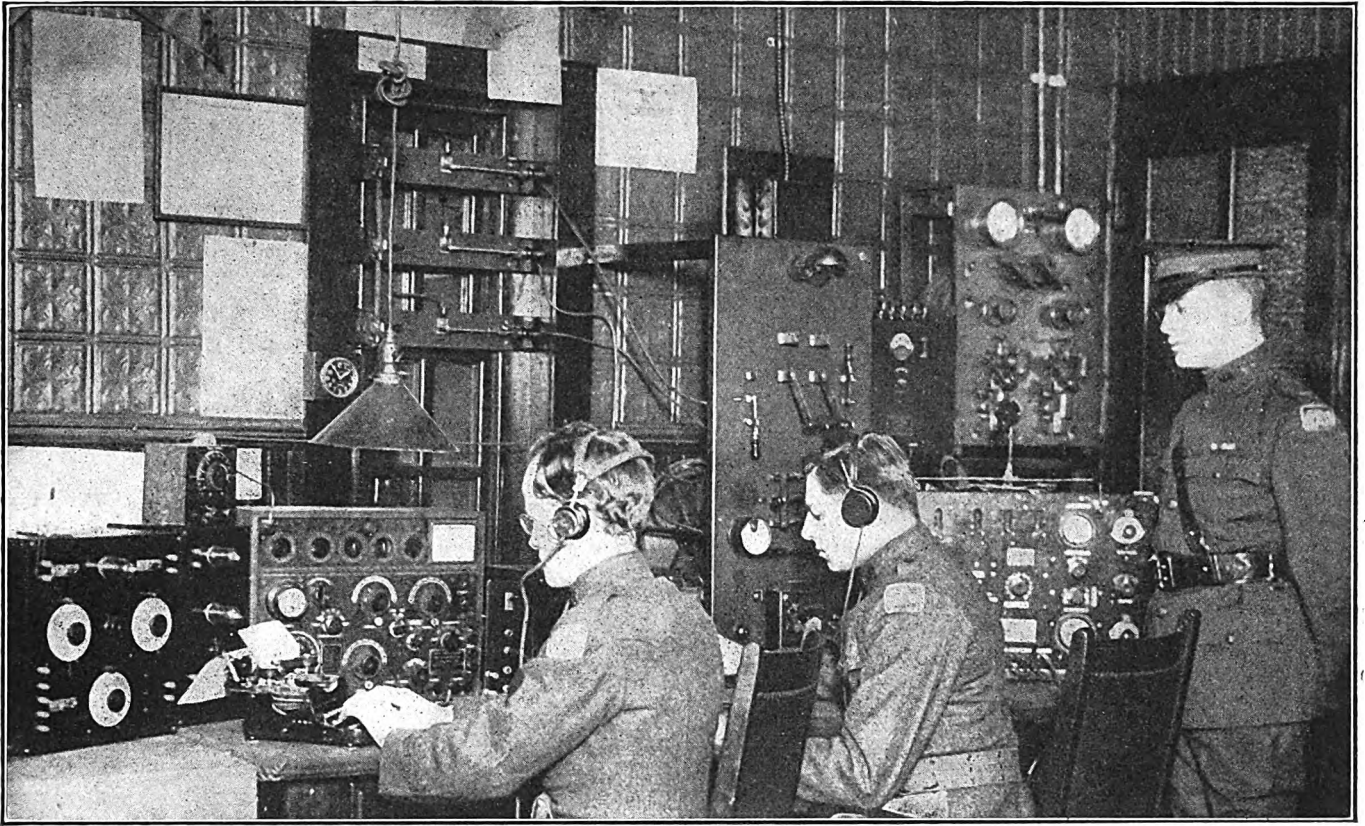
We'll Not Overlook Him

Editor, RADIO WORLD: Our school is one of the largest in the world, and many of our radio "bugs" read your paper because it is written so they can understand it. Inasmuch as there are more young people than adults with minds sufficiently plastic to take up radio work, your paper will prosper in the radio it can hold the young people up to high-school and college age.

Such articles as those in The Radio Primer are needed to make your paper invaluable to the millions of radio "bugs." Young people are hungry for information and they have the plasticity of mind to take it up. As a teacher, I talk from experience. I know any number of prosperous businessmen who have spent upwards of \$50 for radio apparatuses, but are already tired of radio because they have neither time nor inclination to go deep enough into it to really understand. Therefore, look out for the American boy. There are millions of him.

—Dr. H. V. Bucher, Teachers Council of the Elijah D. Clark School, 425 E. 145th Street, New York City

Radio Class, 101st Signal Corps, N. Y.



(c. International Newsreel)

Interior view of the radio station at the armory of the 101st Signal Corps, N. G. N. Y., showing a complete radio equipment. Operators copying various messages under the supervision of Lieutenant H. G. Martin, who is standing.

THE combination of national military service and expert radio-instruction is now offered by the 101st, Signal Corps, New York National Guard, at its armory, Park Avenue and Thirty-fourth Street, New York City. This organization has drawn scores of amateur operators into its ranks. Classes are conducted regularly. The men are instructed thoroughly in the theoretical and practical problems of radio and Morse telegraphy. Instructors who have qualified as experts in their respective lines, are in charge of the various classes; and the men of the battalion are enabled, therefore, to enjoy the best instruction and training. While the chief interest lies in the radiotelephone, no opportunities are overlooked to provide those who wish an extensive course in Morse telegraphy which offers excellent remunerative positions.

The 101st, Signal Battalion, is part of the second corps area which operates from Fort Wood, Bedloes Island, is fully equipped and able to offer the most thorough and intensive course of instruction, free of charge. When the men are declared proficient, they are assigned to operator's duty at the transmitting and receiving sets that

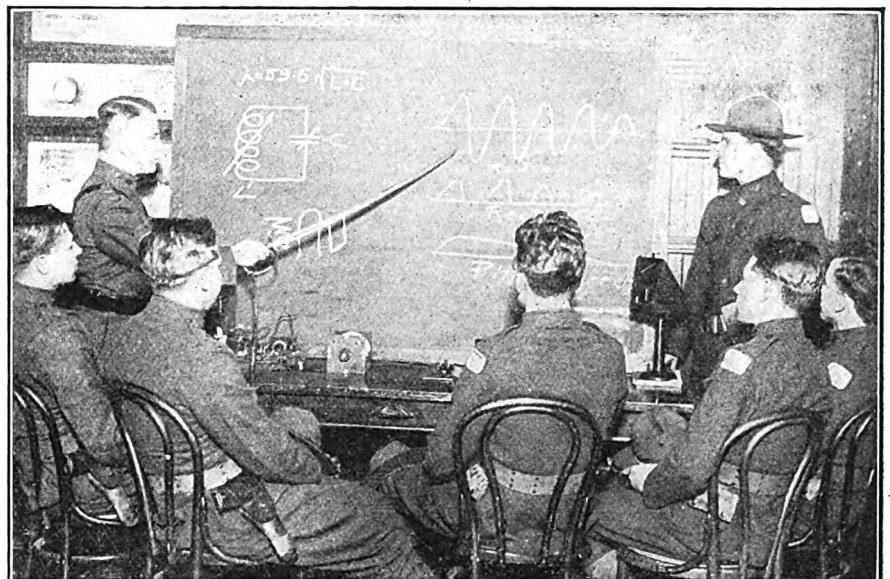
comprise part of the battalion's equipment.

Captain Gorman, the officer in charge, states that besides instruction in radio, enlistment in the National Guard units carries with it many other opportunities.

Members of the National Guard units are free to experiment with the

modern equipment furnished by the war department. Located in the tower of this armory is a workshop where the men may construct any part of apparatus that may be wanted.

The armory is open every Wednesday evening to the public. Concerts are received from the various broadcasting stations.



(c. International Newsreel)

What Uncle Sam is doing in radio instruction can be seen here. Lieutenant Martin telling a class about the underlying principles of radio communication.

Radio Merchandising

Look the Way You are Going

By Fred S. Clark, Business Manager Radio World

If you are going forward—look forward. Look for new customers, and more of them. Suppose you have more orders booked now than you can fill in a month, what does that mean?

Present radio orders are fictitious. If I want, say, an audion-bulb tube, and find my nearest dealer "sold out," I keep going to possibly a dozen places till I get it, thereby making a demand for a dozen tubes while only one is really wanted.

Most every manufacturer is doubling—quadrupling—output. New radio companies and factories are springing up like mushrooms. In a few days or weeks the market will be flooded with radio equipment.

"Bull Durham" knew they couldn't fill an order during the War but that did not stop them from advertising—and get this: they have since found out that it paid them big to advertise when they knew they couldn't fill an order for a year.

Now is the time to look forward; make your name or brand known now. Does Mr. Wrigley stop advertising because he has taken more orders for gum this week than he can fill next? Did Mr. Douglas stop showing his picture, or the Smith Brothers deprive us of admiring their whiskers just because leather was scarce or sugar unobtainable?

Listen, brother! Now is the time to create good will, to look the way you are going, to look forward, to advertise, for all advertising is cumulative. It's the everlastingly keeping at it that brings success. I quit buying cheap hats and now wear a "Stetson," but it took Stetson years of advertising before he "sold" me. Think this over. All those who have kept right on advertising both in good times and bad are millionaires today. Try it, and you will be one too.

Must Kill Certain Evils

Editor, RADIO WORLD: Every week a copy of RADIO WORLD is put on the writer's desk for both present and future reference. We sell a number of your magazines getting them from the News Supply Company.

We began the sale of radio in the years when the customer's query was "Will it get Arlington," and the sales in a year, then, were less than a poor month now.

Owing to the scarcity of "good receiving sets," we feature the books dealing with the "make e'm" radio. The magazine best-sellers are those that tell how to make 'em. They sure do eat up books and magazines.

We also feature all the parts that enter into the making of receiving sets and these parts are many, both little and big, cheap and expensive. It takes one man's time to keep all the parts in stock. There is a scarcity in parts, also, but this is catching up just a little.

With these parts we give a lot of free advice.

Strange as it may seem, the selling of parts seems to help the sale of the ready-made receiving sets.

We think your idea of a dealers' association or organization is excellent. The mushroom growth of the last few months while bringing abnormal sales, at the same time has brought with it certain evils that must be done away for the good of radio. —Smith Novotny Electric, Inc., by S. J. S., Charlotte, N. C.

New Dubilier Corporation

Wall Street hears there is to be formed a new corporation to be known as the Dubilier Condenser and Radio Company, according to the New York "World," to take over the Dubilier Condenser Company, the Federal Mica Company and the Cambridge Manufacturing Company, all now controlled by William Dubilier, inventor of the condenser bearing his name and in use on most of the wireless telegraph instruments.

The new company will manufacture condensers and other accessories utilized in radio operations. Its proposed capitalization is \$500,000 of 8 per cent. non-cumulative preferred stock of a par value of \$100 a share and 160,000 shares of no par value common stock.

Chicago Show, June 15

Milo E. Westbrooke, of Chicago, announces that he will conduct a radio show in that city from June 26 to July 1. The show will be held in the Leiter Building. In addition to manufacturers' displays there will be shown the initial parts necessary for the beginner to put together the "Junior Radiophone." Demonstrations will be given daily on receiving and sending that the working parts may be understood.

Ford Places Big Order

SAN FRANCISCO—Henry Ford, by telegraph, placed an order for "a large amount" of radiotelephone supplies with a San Francisco firm. No indication was contained in the telegram as to the exact use Mr. Ford would make of the supplies.

Buffalo is a Broadcaster

A new broadcasting station started operations in Buffalo on April 15. It is the first broadcaster in Western New York. The station will be operated by Edward Streigel with 360-meter wave length and will broadcast news over a radius of about 30 miles.

Big Growth in Radio

One concern expects to do a business (in radio equipment) of well over \$50,000,000 this year, judging by the returns of the past few months, says "Scientific American." There is an everincreasing demand for vacuum tubes; it is estimated that by this writing 75,000 tubes are being turned out a month, and that by the time this

reaches the reader, the production will probably exceed 100,000 tubes per month. Authorities in and out of radio are of the opinion that the radio business as it is now developing is going to be greater than the phonographic industry, which has been doing a business in excess of \$400,000,000 per year.

Communicate with Them

Editor, RADIO WORLD: I am very much interested in developing some special uses of high melting-glass for industrial purposes, and am anxious to get in touch with large manufacturers of radio apparatus so that I can find out their views on the possibility of utilizing such glasses in radio work. I shall be obliged if you will forward me the names and addresses of manufacturers of the more expensive types of radio equipment. —A. E. Marshall, 3034 St. Paul St., Baltimore, Md.

Editor, RADIO WORLD:—Will you kindly furnish us with the names and addresses of a few of the largest dealers in complete radio equipment who would probably like to place agencies in Europe for their equipment. We are desirous of representing some reliable firm in Europe.—Thos. L. Garrett, 1112 East Main St., Richmond, Va.

Oidar Making Deliveries

OIDAR RADIO MANUFACTURING CORPORATION, 508 West 55th Street, New York City, is now in production on their "Oidar" variable condensers and are making deliveries to dealers and jobbers. The manufacturers claim for the "Oidar" condenser many features worthy of investigation. This company contemplates the manufacturing of a complete line of parts in the near future.

New Radio Firms and Corporations

Redifone Corp of America, Manhattan, make wireless specialties, \$10,000; M. L. and J. A. and R. P. Zobel. (Attorney, D. Harrison, 220 Broadway, New York.)

Radio Equipment Corp., Philadelphia, \$5,000. (Corporation Guarantee & Trust Co.)

Albany Radio Corp., Albany, \$10,000; J. L. and L. W. Gately, K. E. Donovan. (Attorney, L. Silberman, Albany, N. Y.)

Simon Radio Corp changes name to Ray Phone Radio, New York.

Radio Manufacturing and Rental Corp. changes name to Houck Radio Manufacturing and Rental Corp., Wilmington.

Goodhand, Smith & John changes name to Goodhand, Buckel & John, New York.

World Radio Club, Wilmington, Del., for study, \$500,000. (Colonial Charter Co.)

Sun Radio Manufacturing Co., Manhattan, \$5,000; M. H. and S. Spielman, V. Spence. (Attorney, A. B. Friedman, 38 Park Row, New York.)

A. & A., Radio Supplies, 1244 Gates Avenue, Brooklyn, N. Y.

Virginia Auto Supply Co., Richmond, Va. Distributors and jobbers in radio material.

(Continued on next page)

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parts and apparatus. Very com-
prehensive stock on hand.

SIGNAL SYSTEMS SERVICE CO.

1 E. 42nd St., New York City

(Continued from preceding page)

Clarkson Radio Equipment Corp., changes name to Radio Picture Corp. of America.

Visualtone Corp., changes name to Visualtone Company of America, Philadelphia.

Queens Radio Co., Winfield, Queens Co., \$10,000; S. A. Barone, J. Diblasi, G. J. Maggi. (Attorney, O. H. Droege, 47 West 42nd St., New York.)

Rosemark Radio Corp., Manhattan, radio outfits, \$10,000; L. Markowitz, J. Rosenbaum, L. Soff. (Attorney, J. Krinsky, 320 Broadway, New York.)

Wilmington Electrical Specialty Co., apparatus, \$50,000; Willard S. Wilson, Frederick R. Gooding, Joseph H. Gooding, Wilmington. (The Company, Wilmington, Del.)

Larney Smith Radio Mfg. Corp., Man-
nington, Del., equipment, \$100,000. (Colonial Charter Co.)

Liberty Radiofone Co., Wilmington, Del., \$500,000, wireless apparatus. (Corporation Trust Co. of America.)

Larney Smith Radio Mfg. Corp., Man-
hattan, \$10,000; T. and A. C. Dunworth, C. Larney. (Attorney, J. J. Sammon, 350 Broadway, New York)

Roberts Radio Co., Brooklyn, \$20,000; G. S. Rice, S. B. McNeil, M. H. Kern, (Attorney, G. H. Boyce, 44 Court St., Brooklyn, N. Y.)

Paramount Radio Parts and Die Corp., Manhattan, \$10,000; J. and L. Blum, J. Z. Weekly. (Attorney, F. De Vries, 97 Cedar St., New York.)

American Insulator Corp., 52 Vanderbilt Ave., New York.

Butters Horlick Radio Co., 258 Wash-
ington St., Boston.

The Wireless Shop, Punxsutawney, Pa.
Radio call: 3 AGV.

Pittsburg Radio and Electric Co., 130
Bedford St., Boston.

Consumers' Electric & Radio Co., 558
Knickerbocker Avenue, Brooklyn, N. Y.
Dealers of radio parts and equipment.

National Radio Supply Co., 1403 H. St.,
N. W., Washington, D. C.

A. V. Gregory, 42 Broad Street, Red
Bank, N. J.



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By A. Hyatt Verrill

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socket in your home and receive good results from
your receiving set. Fool proof and no danger. It
comes ready to use; just screw into light socket
and connect to aerial post of set. Save cost of
wire and lightning switches. Will operate on blub
or crystal sets. Guaranteed to give good results.
Price \$3.50, postpaid. (\$4.00 west of Rockies.)

Dealers and Agents Wanted
WOLF RADIO COMPANY
208W Scherer Bldg., Detroit, Mich.

43-plate Variable Condensers (.001 M.F.)	\$6.00
25-plate Variable Condensers (.0005 M.F.)	4.50
11-plate Variable Condensers (.00025 M.F.)	4.00
3-plate Variable Condenser (used as a Vernier)	3.00
Above prices include knob, pointer, and dial. Hard Rubber Panels for above. Immediate shipments from stock. Discounts to Bona Fide Dealers	
F. Jos. LAMB COMPANY 1070 Franklin Street Detroit, Mich.	

IMMEDIATE DELIVERY

Discounts to jobbers and dealers
AERIAL WIRE.

19 strand tinned silicon bronze
VARIABLE CONDENSERS

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EISEMANN HEAD PHONES

Super-sensitive

Variometers Variocouplers

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SPEAKER SETS

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why is a honeycomb
coil set better?

read the RADIO RED BOOK
25¢ 406 W. 31st ST. 25¢

Hard Fibre Parts For Radio Work

Also "Varno" Radio Tubing

In diameters from 2½" to 6"
Lengths up to 12"

J. SPAULDING & SONS CO., Inc.

NEW YORK —484 Broome St.
BOSTON —15 Elkins Street
PHILADELPHIA—141 North 4th St.
CHICAGO —659 W. Lake St.
TONAWANDA —N. Y.

DEPENDABLE TESCO LINE



Unmounted
\$6.50

Panel
Mounted
\$8.50

No. 41 Precision Variometer

Mail Orders Filled From Stock

DEALERS: Write for Bulletin, R-10

Manufactured by

The Eastern Specialty Co.

3551 N. 5th St., Philadelphia, Pa.

KEYSTONE VARIABLE CONDENSERS

21 Plate
\$3.80

43 Plate
\$4.75

Our selection of materials and built-up type design give assur-
ance of low energy loss and high efficiency.

Agents and Jobbers write for information.

KEYSTONE MOTOR COMPANY

OAKS, MONTG. CO., PA.

EQUIP your receiving set with the **Magnavox Radio**—the only reproducer constructed on electro-dynamic principle. Write for booklet and name of nearest dealer.

THE MAGNAVOX CO.
Oakland California
370 Seventh Ave., N. Y.

Radio brings it
MAGNAVOX
tells it

ENCO

"B" BATTERY

No wires used in any of its construction

VARIABLE and REFILLABLE

For refills use standard **17c** flashlight unit cells

Enco Electric Novelty Co.
603 W. 130th ST., New York City

20% TO 33 1/3% OFF ON RADIO SUPPLIES

That's the club's motto
CLUB'S OBJECT

Saving of dollars and a united voice to be reckoned with in matters of interest to Radio Amateurs.

Membership fee, the small sum of 25 cents per month.

Membership blank mailed upon request.

CORUBIA ELECTRICAL PURCHASING CLUB

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Bet. Lexington & 3rd Ave., N. Y. C.

THE BEST PROTECTION AGAINST LIGHTNING

"JACOBUS" VACUUM



TYPE J. S. W. AERIAL PROTECTOR

This improved lightning arrester is absolutely positive, efficient protection against the heaviest lightning storms. Approved by the National Underwriters to replace lightning and ground switches. Its simplicity, easy installation and forget-proof feature recommends it especially for the amateur.

ELIMINATES SWITCHES

Receiving stations with JACOBUS Protectors do not require lightning or ground switches. Protection every minute of the day and night. No worry about throwing switches.

GOOD FOR INNUMERABLE DISCHARGE

Discharges of lightning or static on the JACOBUS do not affect its life. After conducting a discharge to the ground, the tube is ready for another operation. Does not weaken or in any way affect the efficiency of the set.

\$2.00 From Electrical Dealers Sent Direct

APEX ELECTRICAL SPECIALTY CO., Inc.
77-B Orange St., Newark, N. J.

Do Insects Know Radio?

We humans who have looked upon the insect world with tolerant pity are to be roughly awakened in this boasted era of civilization, says the New York "World," for it appears that even the lowly lightning bug and cockroach have for eons and eons been on terms of contemptuous familiarity with the greatest wonder of modern science.

Supercilious homo sapiens flatters himself that only he can talk to his kind across the ether. But it is now declared that when Marconi staged his first successful experiment, one lightning bug, spreading his antenna-feelers, radioed to his mate, "Well, the poor boobs have learned the trick at last."

And a cockroach, attuning himself to the proper wave-length, called back, "Hear! Hear!"

Hamilton Bailey of Peoria, Illinois, a navy wireless operator in the war, yesterday announced that it's radio that makes the lightning bug light; and in Harrisburg, Pennsylvania, Howard Zimmerman, National Guard Sergeant, Major, disclosed the cockroach's secret.

Bailey's discovery is this: Lightning bugs are equipped with miniature audion bulbs, a broadcasting apparatus, low radio-frequency and a short wave-length. The feelers are the aerial and the result is a radio light signal station.

As for the cockroach, Zimmerman made his discovery in his barracks in Luxembourg—that's the sort of barracks they were. Experimenting at night school with a quarter-meter wave-length, he found a cockroach with a wave length of half an inch and a very low frequency interfering with the human apparatus.

Further investigation, Zimmerman says, revealed that the despised insect is quite a little electric power plant. Believe it or not.

This Advertising Goes Far

Speaking from the Westinghouse Broadcasting Station, at Newark, and using radio for the first time to describe a port and its functions, Eugenius H. Outerbridge, chairman of the Port of New York Authority, declared that the projects now under way for the development of the Port of New York, "should command the sympathy, the interest, and the support of the vast number of people who will share in the benefits to be accomplished." He said that the Port of New York had a personal significance to all in the invisible audience to which he spoke, no matter in what State they lived. The keynote of his address was the service that New York renders to the entire nation, and he emphasized its position as the center of distribution and the world's biggest market.

Be sure to get Radio World every week so you can bind your 52 numbers into one volume. Subscribe. \$6.00 yearly; \$3.00 six months; \$1.50 three months. (Adv.)

do you know how to test a crystal?

read the **RADIO RED BOOK**
25c 40c W. 31ST 25c

—FOR IMMEDIATE DELIVERY—

We offer the following items of our own manufacture:

Variable and Fixed Condensers.

Mounted Crystals. **Crystal Detectors.**
Distributors for—Grebe, De Forrest, Federal, Acme, Thordarson, Fada.

WHOLESALE ONLY—LARGE STOCKS
RADIO SHOP of NEWARK

(Telephone Market 9807)

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NEWARK, N. J.

Dealers: Forward Your Inquiries Promptly

RADIO INVENTIONS and other ideas promptly patented by reliable Patent Attorneys & Engineers. Call or write. **FREE ADVICE.**

ASK MANUFACTURERS PATENT CO.
FOR **520 FIFTH AVE.**
NEW YORK

BOYS DO NOT FAIL

To obtain your copy of these instructions. Worth many times the small amount we ask. How to construct a variometer, how to construct a variocoupler and an amplifying transformer. Detailed instructions of either for fifteen cents or put four dimes in an envelope and get the three with diagrams of connections for your set. Save money by constructing your own. We have left no details to guess about. We enclose list of all parts how much of each to get and where to obtain same.

Newco Radio & Electrical Supply Co.
Stratford, Conn.

DEALERS

We can make prompt shipments on

Variometers	Crystals
Variocouplers	Crystal Detectors
Switch Levers	(enclosed)
Variable Condensers	Pony Insulators
(23-48 Plate)	Fixed Condensers
Switch Points	Radio Plate

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NOVO

"B" BATTERIES

FOR YOUR RADIO SET

All standard sizes 22½ to 105 volts.



For Sale by Leading Dealers

NOVO MFG. CO.

NEW YORK—424-438 W. 33rd St.
CHICAGO—531 So. Dearborn St.

HAYNES TESTED EQUIPMENT

This is an exclusive radio shop. We sell nothing else. For honest values and satisfactory results call on us.

The HAYNES RADIO SHOP
629 Lexington Ave., New York
At 54th Street Plaza 6801

100% BETTER RESULTS

WITH

"AEROPLANE" WIRE

For Aerials

19 strand silicon bronze—each strand tinned.

The Wire used by the U. S. Army and Navy during the War.

HOOK UP BLUEPRINTS

These prints are clearly drawn and each is accompanied with instructions in plain English so that any layman may readily understand them.

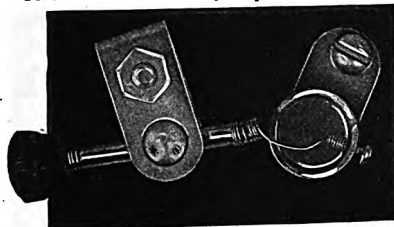
Dealers Write For Proposition.

HINTZE BROS. Inc.,

459 CENTRAL AVENUE
NEWARK, N. J.

LOOK

The "Junior" Crystal Detector



THESE

CRYSTAL DETECTORS

Are The Very Best For Constant Satisfactory Results.

Lowest of All in Price

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RADIO WILL MAKE YOU MONEY

Well known established concern manufacturing WIRELESS specialties offers investors an opportunity to participate in big profits to be made in the WIRELESS INDUSTRY EXPANDING BUSINESS. Not a promotion.

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Books Now Open for Subscriptions.

Factory, offices and demonstrating rooms, Testimonials open for inspection. Strictest investigation invited. Call or write for information.

G. BOISSONNAULT CO.

26 Cortlandt St., New York.

The New Sport

THERE is a new indoor sport. It is that of forming radio companies, says the New York "Mail." Each week develops a new group. Ninety per cent. of them have the popular Delaware charter.

It has been said that when Greek meets Greek they start a restaurant. Nowadays, when promoter meets promoter they start a radio corporation. During the past week the writer saw several notices of incorporations that mentioned such ambitious figures as ten, fifteen or twenty millions. What is ten or fifteen millions? Nothing in the life of a good promoter.

Tons and tons of stock promotion literature are being dropped in the mail daily. Shares are selling for a few cents, so that "nobody can afford to miss this golden opportunity."

The editor warns his readers to investigate the claims of some of these new corporations very carefully before investing money in any of the stock.

Some people get unduly excited when they see a few patent papers. The patent is the most important weapon of the promoter. It gives him something convincing to talk about.

Navy Designs Amplifier

Edwin Denby, Secretary of the Navy, announces that the Bureau of Engineering of the Navy Department has finally arrived at a successful design of a universal amplifier for radio communication and similar purposes.

While the amplifying qualities of the three-electrode vacuum tube have long been known and used; yet, heretofore, the amplifiers obtainable would only amplify incoming signals over a narrow band of wave lengths. In the Navy, as well as with other users of radio equipment, it is desirable to have apparatus which will receive over a very wide range of wave lengths. The amplification should be as strong in one region of wave length as in another if it is to be universal or serve a wide range of communication.

Some time ago, the research organization of the Navy was directed to give special consideration to the problem of a universal amplifier, with the result that Dr. J. M. Miller, of the Navy's Radio Research Laboratory in Washington, recognized that the application of certain principles would solve the problem, and his theory in this matter has been verified by the construction of a six-stage amplifier which gives practically the same amplification from a lower limit of several hundred meters to an upper limit in the neighborhood of 20,000 meters.

have you the symbols
& abbreviations?

read the RADIO RED BOOK
25c 406 W. 31st St. 25c

ATTENTION AMATEURS!

Special Offer for this week
Aerola Sr. with 2 batteries and Complete Antenna Equipment\$71.75
Loading Inductance (tapped) 2.45
Dials90
Butters-Horlick Radio Co.
258 Washington St., Boston, Mass.

RADIO CABINETS

Manufactured

in any Style, Size or Quantity
A. E. CHERNACK & CO., INC.
314 E. 75th ST., NEW YORK
Phone Rhinelander 2747

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Send for free samples of our Window Display Signs and Cartoons featuring RADIO EQUIPMENT.

Attractive, snappy result getters.

Merchants Signs Service Co.,
48 Zabriskie St., Jersey City, N. J.

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We Carry a Full Line of
RADIO GOODS
Head Sets, Vacuum Tubes, Varie Couplers, Variometers, Transformers, Tuning Coils, Dials, Knobs, Bakelite Panels, Phones in stock.
Radio Sets Made to Order. Aerials put up.
SUNBEAM ELECTRIC COMPANY
71 3rd Ave., Bet. 11th & 12th St., New York
Phone Stuyvesant 2890 Etab. 12 Years

PAPER TUBES FOR WIRELESS

ALL SIZES ON HAND
FOR IMMEDIATE DELIVERY
WHOLESALE AND RETAIL
BAEHM PAPER CO., INC.
219 FULTON STREET NEW YORK
Bet. Church and Greenwich Sts.

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PARTS and SERVICE
FOR DEALERS and PUBLIC

Write us for what you want. Mail orders given prompt attention

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Manufacturers'

Distributers of Everything

RADIO

REX RADIO SALES CORP.
1452 Broadway, New York

RADIO WORLD'S QUICK ACTION CLASSIFIED ADS

This department is intended for everybody who wants quick action on short announcements covering the buying, selling, exchanging or general merchandising in the radio field. Readers of RADIO WORLD will find that it pays to read these columns every week. Advertisers will get a ten-day service here—that is, copy received for this department will appear in RADIO WORLD on the news-stands ten days after copy reaching us.

The rate for this RADIO WORLD QUICK ACTION CLASSIFIED AD. DEPT. is 5c. per word (minimum of 10 words, including address), 10% discount for 4 consecutive insertions, 15% for 13 consecutive insertions (3 months). Changes will be made in standing classified ads., if copy is received at this office before 4 P. M. on any second Tuesday preceding date of publication. RADIO WORLD CO., 1493 Broadway, New York City. (Phone, Bryant 4796.)

"Superior Radio Sets" Consisting of inductance tuning coil, with 2 ten point switches, 28 plate condenser with Electrode Dial, latest improved crystal detector, and many other new features. Mounted on 3/16" Radion Panel, grained mahogany finish, in handsome cabinet, \$25.00 without phones and aerial. \$30.00 with No. 56 Murdock double phones. Audion Detectors, Amplifiers and Parts. Quick factory shipments. 50% cash with order, balance C. O. D. Light Metal Products Company, 512 East 137th St., N. Y.

SOMETHING NEW

Keep a complete file of your Radio programs—your comments—your company—with the Radio Daily Record—100 only 50c.—postpaid. Radio Record Store, 247 West 47th St., New York.

Big Money and Fast Sales—Every owner buys Gold Initials for his auto. You charge \$1.50; make \$1.35. Ten orders daily easy. Write for particulars and free samples. American Monogram Co., Dept. 198, East Orange, N. J.

Build Your Own Radiophone.—Send ten cents for instruction book. Radio Service Institute, U. S. Bank Building, Washington, D. C.

Fifty (50) of the best and most popular vacuum-tube hook-ups profusely illustrated and described. By mail prepaid 25c. D. Rosenstein, 387 Williams Ave., Brooklyn, N. Y.

Unassembled Varlocouplers—\$1.50. No. 24 enameled Wire per 1/2-lb. spool, 65c. Open 5 to 9 P. M. 2 Flights up. F. W. Camarda, 3316 Church Ave., Brooklyn, N. Y.

Crystal Set That Gets Radio Concerts. Build it right boys. Plans and full instructions for building at low cost, high grade fine adjustable Crystal Receiving Set, fifty cents postpaid. Dept. R. D. Shaw Mfg. Co., Galesburg, Kans.

Have You a Radio Set?—If not try my system in getting one. I sell at reduced prices, batteries, tools, sporting goods, merchandise of all kinds. Try me. Anderson, 340 Park Ave., N. Y.

We buy your Radio goods. Head sets wanted. Radio Shop, 1246 Gates Ave., Brooklyn, N. Y.

We buy second hand radio goods, any description. Columbus Shop, 874 Columbus Ave. (103d). Open evenings to 10 o'clock.

Wanted.—A few Western Electric VT-1's, VT-2's and head sets for use in our laboratory. Must be perfect. State quantity and lowest price. Reading Radio Shop, Box 6, Reading, Mass.

Wanted.—Men—Boys over 17. Become Railway Mail Clerks. Commence \$133 month. Common education sufficient. List positions free. Write immediately. Franklin Institute, Dept. E 152, Rochester, N. Y.

Wanted for spot cash. High grade Radio outfits, parts, attachments and materials of standard makes. No home made apparatus will interest us. Address F. J. Lamb, 1938 Franklin St., Detroit, Mich.

Enclose self-addressed envelope and receive free illustrated bulletin of 22 up to date Blueprints of Receiving and Transmitting designs. We are the largest firm in the country specializing solely in Blueprints. Number 349 gives full constructional and other data for building Crystal Receiver for only \$5.00. Ask for bulletin 44. Experimenters Information Service, 45 Pinehurst Ave., New York.

Bargains—Camara, \$3; Chuck, \$4; \$50 Cornet; \$28 Mele; 39 Foxom. East Haven, Conn.

Look! Supersensitive Galena! The wonderful mounted crystal. Buy the best. Satisfaction guaranteed. 50c., postpaid. Superadio Laboratory, Detroit, Michigan.

AMERICAN MADE TOYS

Manufacturers wanted for large production and home-workers on smaller scale for Metal Toys and Novelties, Toy Soldiers, Cannons, Cowboys, Indians, Buffalo Bills, Wild Animals, Whistles, Bird Whistles, Race-horses, Prize-fighters. Wag-tail Pups, Barking-dogs, and hundreds of other articles. Hundreds and thousands made complete per hour. No experience or other tools needed. Bronze casting forms complete outfit from \$5.00 up. We buy these goods all year, paying fixed prices. Contract orders placed with manufacturers. Exceptionally high prices paid for painted goods. An enormous business for this year offers industrious men an excellent opportunity to enter this field. Write us only if you mean real business. Catalog and information free. Metal Cast Products Co., 1696 Boston Road, New York.

100 ft. 7 strand Copper Aerial Wire	.....\$ .71
100 ft. Hard Drawn Copper Aerial Wire	..... .49
Aerial Insulators	..... .23
Nickel Plated Binding Posts	..... .04
22 1/2 Volt small "B" Battery	..... .90
22 1/2 Volt large "B" Battery	..... 1.40
22 1/2 Volt large variable "B" Battery	..... 1.90
45 Volt double size Variable "B" Battery	..... 2.80
Nickel Plated Constant Points	..... doz. .20
Nickel Plated Switch Arms	..... .57
Branch Lightning Protectors	..... 2.37
Porcelain Vacuum Tube Sockets	..... .56
1/4 inch Slider and 10 inch Rod	..... .45
Coils wound on Tube	..... .75
Crystal Detectors, (N. Y.)	..... 1.20
Mounted Tested Galena	..... .25

LIBERTY RADIO CO.

Church and Liberty Streets, New York City, N. Y.
Phone Rector 3432

"Radio inventions of merit developed or financed."
H. William Baer, 162 Wood St., Waterbury, Conn.
Have Radio World sent to your summer Home

If you are moving to the country, be sure to have RADIO WORLD sent to your summer address. Subscribe now, and, in doing so, instruct our subscription department to have RADIO WORLD sent for the coming few weeks to your town address and then to your country home, during the summer. \$6.00 a year; \$3.00 for six months; \$1.50 for three months. RADIO WORLD CO., 1493 Broadway, New York City.

Complete your file of Radio World

Copies of Radio World No. 1.

If you did not get a copy of Radio World No. 1 send us \$6.00 and we will send you the paper for one year, and start it with our first issue, which will be mailed you as soon as possible after receipt of order. (Adv.)

Subscribe for RADIO WORLD direct or thru your newsdealer. \$6.00 a year, \$3.00 for six months, \$1.50 for three months.

NEWSDEALERS ATTENTION!

Many of your customers will want the first six issues of Radio World. Your wholesaler may have a few copies on hand. Inquire. If you cannot get back numbers write us and we will try to supply you so that your customers will have a complete file of Radio World from the first issue.

If you happen to have a few copies on hand, keep and display them and you will find that they will sell. Very shortly it will be impossible to get back numbers of these earlier issues.

Radio World, 1493 Broadway, New York City.

Subscribe for RADIO WORLD direct or thru your newsdealer. \$6.00 a year,

52 Weeks for \$6.00
Complete Your File of RADIO WORLD
Copies of Radio World No. 1.

If you did not get a copy of Radio World No. 1, send us \$6.00 and we will send you this paper for one year, and start it with our first issue, which will be mailed you as soon as possible after receipt of order. (Adv.)

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Please send me RADIO WORLD for.....months, for which please find enclosed \$

SUBSCRIPTION RATES:

Single Copy\$.15
Three Months 1.50
Six Months 3.00
One Year (including Special Nos.) 6.00
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The Latest In Radio Every Seven Days—15c A COPY
OUR OWN SPECIAL BROADCASTING MAP IN THIS ISSUE

RADIO WORLD

Entered as second-class matter, March 28, 1922, at the post office at New York, New York, under the act of March 3, 1879

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MAY
20th,
1922

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A COPY

1 year, \$6.00

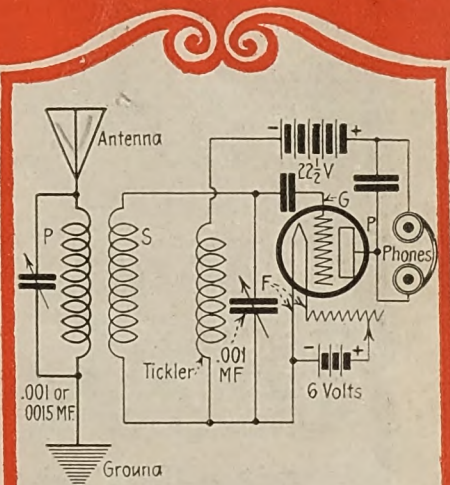
6 mos., 3.00

3 mos., 1.50



(C. P. & A. Photo)

The voice of radio will be heard by them this summer! Miss Mildred Fenn (aloft) and Miss Mildred Redmond (on deck) taking the first steps in equipping their little motor-boat with a wireless outfit.



A subscriber made a regenerative set from this diagram, published originally in Radio World No. 5, dated April 29, and picked up over seven different broadcasting stations. Full description inside this issue.

**Our Aim Is
Service**

May, Linwood, White, Ehlert, Bragdon—All in this issue.

De FOREST

"SYNONYMOUS FOR GOOD
RADIO EQUIPMENT ALL
OVER THE WORLD"



Radio instruments are among the most scientific of all instruments and their manufacture requires not only mechanical skill, but scientific knowledge and appreciation of delicate and intricate instruments. De Forest radio apparatus for amateur, commercial and laboratory use has long been recognized by scientists, engineers and operators as the finest in the world. No attempt has ever been made to meet price competition, our aim having been to provide the radio man with instruments and apparatus which would give efficient, dependable service under the exacting conditions which radio communication has to meet with.

Broadcasting brought about a tremendous demand for radio receiving equipment. Apparatus had to be developed suitable for use by Mr. Average Citizen and his family and production had to reach huge figures almost overnight. Yet in spite of the demand for sets, sets, more sets, we adhere to our policy of the past decade: Every set manufactured by us is made of the best materials, carefully and accurately constructed and is thoroughly tested before leaving our laboratory.

The Everyman Receiver

A simple, easily adjusted, crystal detector receiving set in a handsome walnut finished cabinet, complete with receivers at \$25.

Radiohome Receiver

A De Forest radiophone with a vacuum tube detector at \$36. Antenna, phones, batteries and vacuum tube bring the total cost to about \$75.

DT-800 Amplifier

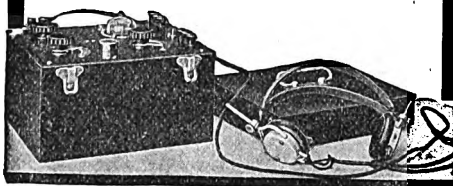
A two-stage amplifier in cabinet identical with those of the Everyman and Radiohome and giving signal strength sufficient to operate a horn. \$35.

Interpanel MR-6 Receiver

A set unsurpassed in appearance, efficiency and dependability and having a highly selective tuning system with 150-25,000 meter wavelength range. Price, \$112.

**De FOREST RADIO TEL. &
TEL. CO.**

Jersey City, N. J.



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**WIRELESS APPARATUS
OF
QUALITY and EFFICIENCY**

Manufacturers of
Crystal Receiving Sets
Fixed Telephone Condensers
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Double Headsets 2,000 and 3,000 Ohms
Variable Condensers 23 and 43 Plate
Mounted Fuse Terminals for
Filament Circuit
Lightning Arresters
V. T. Sockets
Rheostats
Mounted Crystal Detectors

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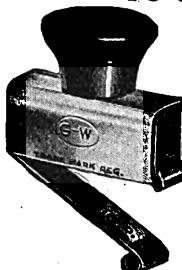
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609 Chamber of Commerce Bldg.
Pittsburgh, Pa.
227 West Side Bldg.,
Kansas City, Mo.
171-2nd St., San Francisco, Calif.

KNOWN FROM COAST TO COAST

G - W SLIDERS



Advertised and sold all over the country because it is Absolutely the Best Slider. Slides easily. Cannot cut or damage wire. Makes perfect electrical contacts. For better tuning, insist upon G-W Sliders. They cost no more.

HIGHLY POLISHED BRASS

3/16" 25c, 1/4" 30c

Ask for G-W Slider Rods

GEHMAN & WEINERT

42 Walnut St. Newark, N. J.

Greatest BATTERY BARGAINS Ever Heard of

Buy direct from the battery builder and save from 50% to 100%

Compare these prices.

STORAGE BATTERIES

80 to 100 Ampere hours \$11.00
100 to 110 Ampere hours 14.00
110 to 125 Ampere hours 16.00

These batteries can also be used for starting and lighting Automobiles as well as Radio.

"B" BATTERIES

The Famous Cyclone Make

	Regular Price	Our Price
22½ Volt	\$1.50	\$1.20
Variable 22½ Volt	2.00	1.50
Variable 45 Volt .	4.00	3.00

RADIOTRONS, \$6.00

Radiotron U.V.201 amplifying tubes
Mail Orders filled upon receipt of money order or certified check

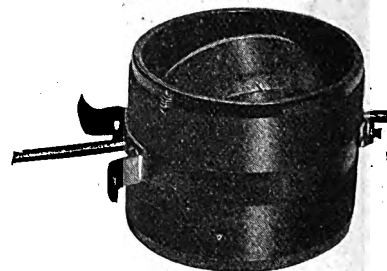
Lexington Vulcanizing Co.

565 LEXINGTON AVE., N. Y.

Phone—Plaza 1826



Our Variometer



We Manufacture Moradio Parts
and Appliances for
Wireless Apparatus

MORELAND SALES CORP.

30 Ogden St., Newark, N. J.

A COMPLETE KNOCKDOWN RADIO SET

Everything except the phones

Includes

**COMPLETE INSTRUCTIONS WITH
EACH SET**

Aerial, Ground Switch, Tuning Coil,
Rods, Sliders and all parts necessary.

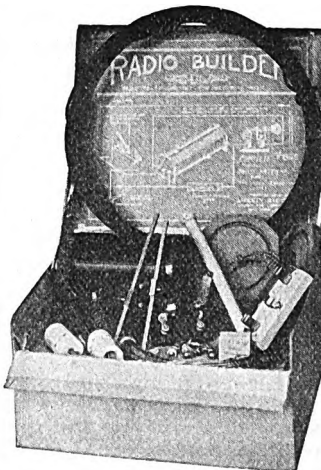
\$6.50

The parts in this set are
"THE EQUAL OF THE BEST"

Dealers Write

LIBERTY RADIO CO.

106 LIBERTY ST., N. Y. C.



RADIO WORLD

[Copyright, 1922, by Radio World Co., New York, N. Y.]

A WEEKLY JOURNAL, PUBLISHED EVERY WEDNESDAY AND DATED SATURDAY BY RADIO WORLD COMPANY, FROM PUBLICATION OFFICE, 1493 BROADWAY, NEW YORK, N. Y.

Vol. I. No. 8.

May 20, 1922

15c. per copy, \$6.00 a year

The Middle Boy Hears the Radio Music



(c. Photograms, N. Y.)

The Boy Scouts of America are doing their share in finding new uses for radio. Thirty thousand youngsters recently paraded in Jersey City, New Jersey, and the "Radio Trio," shown in the photograph, was the greatest attraction. The scout on the middle wheel is enjoying the stunt—for he, alone, is hearing the music. His comrades are carrying the antenna.

"It is difficult to look into the future of radio," says Dr. Charles P. Steinmetz, chief consulting engineer of the General Electric Company, "for it is such a big thing. One thing is certain however. Uninterrupter communication throughout the world is now a reality because of radio."

The radio "bug" has forced its way into the Michigan State Prison. Seventeen hundred men there will soon listen to the "music from the air."

A number of American concerns have representatives in Europe looking for radio material and arranging for its production in some of the idle European factories.

Radiograms

Press reports from Europe are now transcribed at radio stations, through an automatic recording device similar in operation to the phonograph record. The receiving record runs fast while the reproducing machine runs slowly so that the code may be deciphered easily.

A number of enthusiasts are able to predict, with a fair degree of accuracy, cloudy or rainy weather. When the static in the air is heavy, which is indicated by a loud hissing sound in the receiver, one may be certain that bad weather is close at hand.

A radio station has been established on Jan Mayen Island in the Arctic Ocean. It is operated by Norwegians.

The club cars of the Pioneer Limited, the fast C. M. & St. P., R. R., train between Chicago, St. Paul and Minneapolis, will be equipped with radio for the benefit of passengers. All the important news of the day will be received.

L. C. Porter, of Newark, N. J., president of the Society of Motion Picture Engineers, says that motion pictures may be transmitted by radio. "It is possible," says Mr. Porter, "that we will exhibit in our educational institutions educational pictures broadcast by radio."

T T F A

The B Battery and Plate Current

By George W. May, R. E.

USING vacuum tubes either for detector or amplifiers of radio receiving-sets must be equipped with some sort of a battery for supplying high voltage to the necessary plates. It is most essential that this high voltage be required to have the tubes operate properly. This battery is termed the B battery, to distinguish it from the A battery of six volts, and supplies the proper voltage of $22\frac{1}{2}$ volts. Every little precaution must be taken; because, if this battery should be connected into the filament circuit, the tube will burn out immediately.

Various types of B batteries are now on the market and, of course, supply the necessary voltage. Due to the fact that we need a very high voltage with a very small low amperage on the plate of the tube, it is evident that the drain on the battery is very small and, in turn, should last a long time. In fact, the battery will die

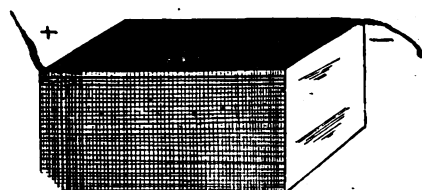


Figure 1. B-battery of the non-variable type.

from age long before the actual current is used up by the tube. In using these so-called B batteries, they can be placed out of sight for many months.

The battery to be considered is the small-type battery that can be carried. They are plenty good enough for ordinary work and will serve very well. However, with certain sets, variation of the B battery will have to be done as every bit of the voltage can be practically used. With the beginner who uses a radiotron tube, U.V.-200, it will be found that this tube will not function properly if the plate voltage exceeds $22\frac{1}{2}$ volts. In fact, it will operate on voltages that are less than the above voltage.

With the varied type battery, if the beginner tests out his tube by experimenting with the different taps of the battery, he will find that his tube will operate perfectly between 16 and 18 volts. This is just for the detector tube. After the tube has been in operation for some time, the voltage will drop, and, of course, a raise in voltage will have to be made. In connecting up the B batteries to your

set, always be sure that the proper connections are made and, as a good check, look over the wiring very carefully. If the connections are not made correctly no signals will be heard.

The beginner who is starting in and does not care to buy a ready-made battery, can make his own by

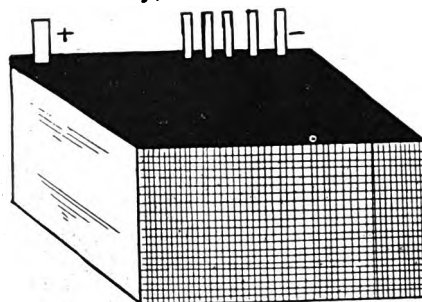


Figure 2. This larger size also a B-battery, is known as the variable type. This battery can be used where a change of voltage is required

simply going to the nearest electrical store and purchasing ten flashlight batteries. By connecting them up he will have a ready-made B battery that will answer the purpose of plate current. Caution should be taken to secure the proper connections in regard to polarity. Connect the positive to the negative, and so on, until all of the batteries are connected. In this manner, when it is completed, the batteries should have a negative and a positive pole, respectively. Due to the air surrounding these batteries, it

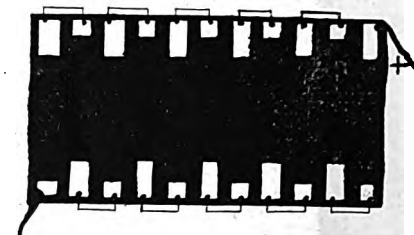


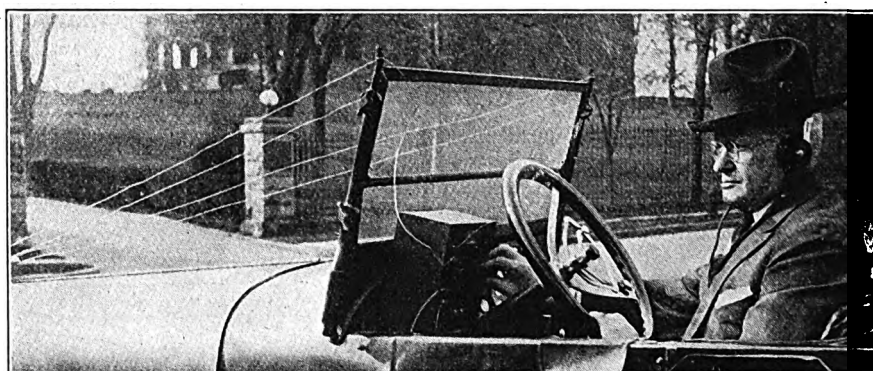
Figure 3. Assembly of flashlight batteries showing the necessary connections. Note the positive and negative poles. The small white squares represent the negative; the large ones are positive.

is a wise stunt to seal them up with some sort of a sealing wax—corrosion will ruin these batteries in time, if this is not done. The best way is to take each battery and dip it in paraffine for a few seconds, so that it will be coated with the wax. This will keep the battery and lengthen its life.

If the beginner reads over the above information regarding B batteries he will have a practical idea of their operation and care.

The beginner in using a B battery should test out to see if he has sufficient current for the tubes he intends to use. Once in a great while, a battery giving 45 volts is sold with the idea that it can be cut down to $22\frac{1}{2}$ volts. In order for the unexperienced man to work with B batteries, he should familiarize himself with the different batteries in order to know the exact amount of voltage needed.

Doctor's Car Equipped with Radio Set



(c. Kadel & Herbert News Service)

Many folks, no doubt, have seen motor cars equipped in various ways, with radio. The question often arises, with much comment, as to the actual working conditions of such a proposed set. In recent issues of Radio World, different types of radio-equipped automobiles have been shown whereby signals and voice could be received over a short range of distance. This same reception applies to the antenna on this car. Dr. L. P. Rubin permitted this photograph to be taken of his radio-equipped automobile, whereby he is able to keep in touch with broadcasting stations within short range of his position. The antenna is strung on the car as can be seen in the photograph. The metal frame of the car is used as a ground.

New Radiophone for Postal Airplane



(c. Underwood & Underwood)

The man in this photograph holding a section of radio equipment is J. C. Henderson, second assistant postmaster-general. He has been inspecting the new 100-watt tube-type radiophone which is intended for use on the airplanes carrying the United States mail. The man in the aviation uniform is L. Hamilton Lee, postal pilot, who holds the six-hour record from Chicago to Washington, D. C. Strapped to him is the mouthpiece transmitter through which a pilot speaks when in flight.

18,761 Messages, Month's Record

Members of the American Radio Relay League, the national organization of radio amateurs, during the month of February, transmitted direct, or relayed, 18,761 messages. These messages were moved by 283 stations. During this month, the busiest amateur station in the country was Yankton College, 9 YAK, of Yankton, South Dakota, which handled 604 messages. Of the eleven divisions into which the A. R. R. L. divides the country, the Atlantic division was the most active. Seventy-four stations transmitted 4,172 messages during the month. The second division was the West Gulf, which

handled 3,174 messages. The old-fashioned spark set is still well ahead of the continuous wave among amateurs. Seventy-four per cent. of the messages were sent by spark stations.

Radio From North Pole

CAPTAIN RONALD AMUNDSEN, the explorer, who is contemplating a five-year trip to the Arctic regions, proposes to keep in touch with civilization by radiotelephony. For the use of Captain Amundsen, a powerful wireless set has been purchased from the Marconi Company

in London. Captain Amundsen claims that his ice-bucking polar cruiser, "Maude," will be able to send messages in code a distance of 2,000 miles. This means that he will be in touch with all stations in the Far North. Linked up with this powerful radio equipment will be sets of American make. Captain Amundsen will start on his journey about June 1.

Condenser Not Always Useful

A phone condenser does no particular good. This is not because of a peculiar nature of the spark, or because of the phones, but because the condenser is supplied in some other way. Generally the condenser action is supplied by the wires in the phone cords.

The Radio Primer

A. B. C. of Radio for the Beginner Who Must Have the Facts Put Plainly and Tersely, and all Terms Fully Explained

Radio Terms at a Glance

DAMPING.—When electromagnetic impulses are sent to the antenna the latter vibrates or, as it is termed, oscillates for an appreciable time; but, sooner or later, the waves will die out. This gradual decrease is called the *damping*. High resistance in the antenna circuit causing a loss in heat is one cause of damping.

DECREMENT.—A term seldom used by the broadcast enthusiast since he is not bothered by it. Decrement is the percentage of decrease in two consecutive waves by some fault in the antenna which produces damping. Damping is the name of the thing itself, while the decrement is the amount of damping.

IMPEDANCE.— (*Im-peed-entz*) —Means hindrance and refers to the throttling of an electric current as it passes around a circuit. If a steady current such as comes from a storage battery is allowed to flow around a wire circuit, there is a certain friction, called "resistance," which tends to limit the amount of this current that can flow. But if the current, instead of being a steady one, is an alternating current—one that flows first in one direction and then in the other—another kind of friction called "reactance" is produced. The impedance combines reactance and resistance.

GRID POTENTIAL. — The amount of voltage placed on that part of a vacuum tube known as the grid when a radio wave enters the detector circuit. This potential is something adjusted by a dry battery known as the "C" battery.

S. S. C. WIRE; S. C. C. WIRE; D. C. C. WIRE.—All of these terms refer to the kind of insulation used on the wire. In the order given, the translations are as follows: Single silk covered; single cotton covered; double cotton covered. The words "single" and "double" refer to the number of layers of the material.

SPAGHETTI TUBING.—A special tubing made of highly insulating fabric. The tubing is used to slip over the connecting wires of receiving sets to prevent short circuits and to give the wiring a neat appearance.

ANTI-CAPACITY SWITCH — Switches embodying a type of construction and method of operation which does not introduce a condenser effect where such a thing would not be desirable.

POTENTIOMETER. — (*Po-tent-she-om-e-ter*). — A resistance coil usually provided with a means of varying the amount of resistance it is desired to use.

The Beginner's Catechism

By Edward Linwood

What is a vacuum tube?

A vacuum tube is a glass bulb shaped very much like the bulb of an incandescent lamp and of similar size. It contains three elements, respectively the grid, filament, and plate. It is given the name of *vacuum* tube because the air within it has been reduced to an exceedingly low figure.

* * *

What is the grid?

The grid may be either a network of fine wire of tungsten tantalum, or

nickel, or a perforated plate of one of the same metals. One end of the grid is connected to the tuning coil and the other end left free.

* * *

What is the filament?

The filament is usually made of finely drawn tungsten wire coiled in a spiral similar to the filament in the ordinary house-light. The filament is heated to incandescence by a 6-volt storage battery. The battery must not be over 6 volts.

What is the plate?

The plate may be either a flat plate of nickel, or, as in some tubes, it may take a cylindrical form completely enclosing the other two elements.

* * *

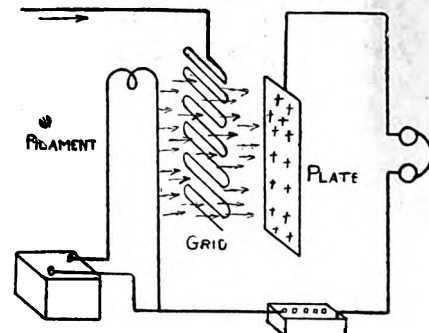
What part does the grid play?

The grid, being the end of the wire from the tuning coil is affected by the radio waves as they strike the aerial and enter the receiving set. These waves are first positive and then negative. The grid, being connected to the same circuit is, likewise, alternately positive and negative. When waves are coming in the aerial, the grid—in its position inside the tube, acts as a magnet would if first one pole were pointed toward the filament and plate and then the other pole. In other words, the grid causes the space within the tube to become positive and negative repeatedly.

* * *

What part does the filament play?

The function of the filament is to provide those minute charges of electricity called electrons. Scientists discovered, many years ago, that when a body was heated to high brilliancy



Graphic representation of a vacuum tube showing the relation between various parts and how the electrons pass from the hot filament through the grid.

the atmosphere about it was charged negatively, that is, if a metal plate were placed near the incandescent body and connected to a sensitive instrument, the latter showed that a current of negative electricity was given off. The reason for inserting the filament into the vacuum tube, strictly speaking, was not a radio reason but an electrical reason.

* * *

What part does the plate play?

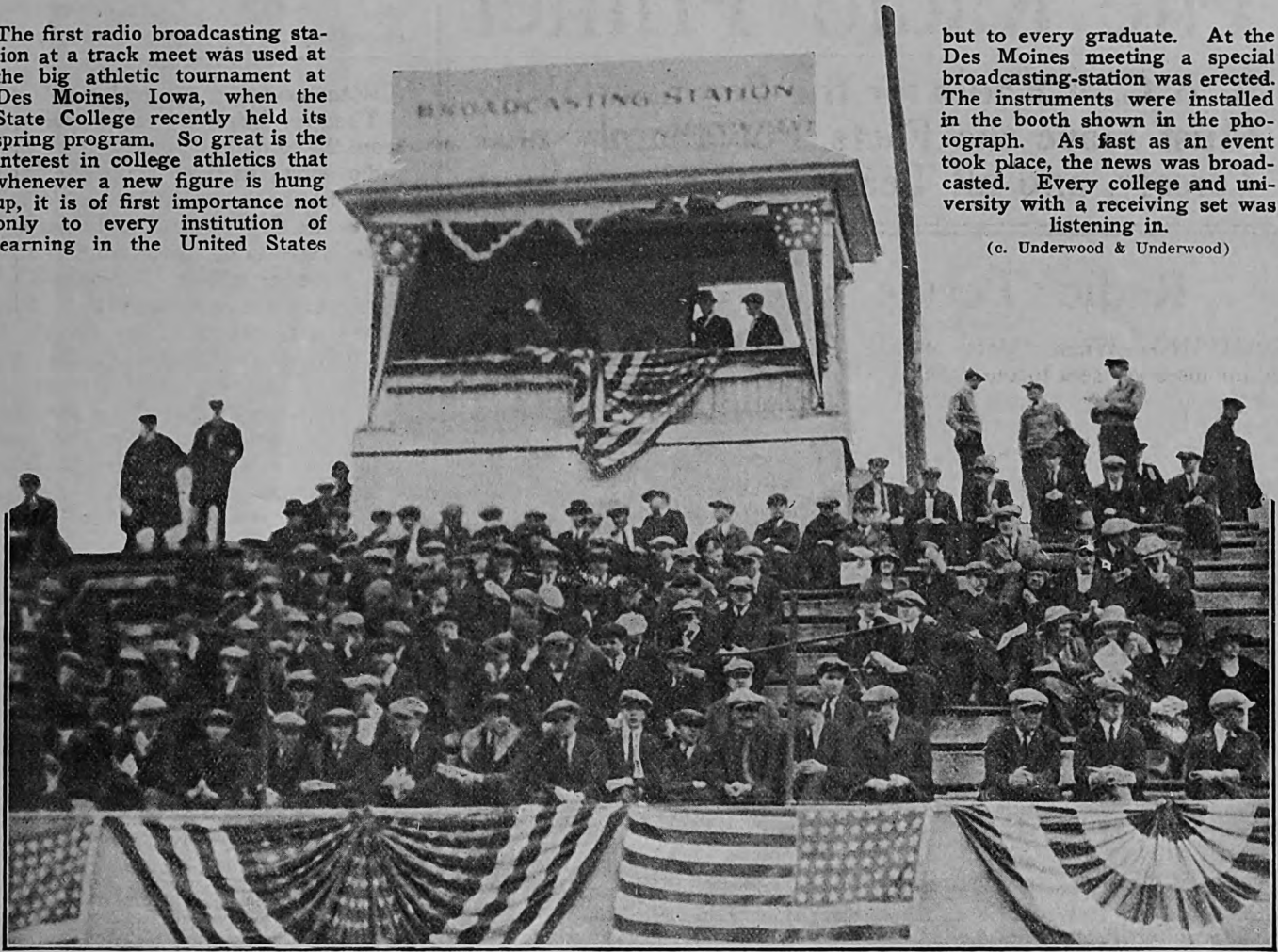
The plate completes what the filament starts. The plate being connected in the circuit so that it is always positive attracts the negative particles from the hot filament. Otherwise, there would be no place for these electrons to go. The plate is never heated to incandescence or even to redness. The current passing through it is very slight, somewhere in the order of decimal 5 to 2 milliamperes. As the common house light

Big Track Meet Radios Results

The first radio broadcasting station at a track meet was used at the big athletic tournament at Des Moines, Iowa, when the State College recently held its spring program. So great is the interest in college athletics that whenever a new figure is hung up, it is of first importance not only to every institution of learning in the United States

but to every graduate. At the Des Moines meeting a special broadcasting-station was erected. The instruments were installed in the booth shown in the photograph. As fast as an event took place, the news was broadcasted. Every college and university with a receiving set was listening in.

(c. Underwood & Underwood)



(Continued from preceding page) consumes about half an ampere, it is a simple matter to appreciate the almost negligible current flowing in the vacuum-tube plate.

* * *

How do these three elements work together to act as a detector?

In the illustration, the three parts are shown in the same relation which they assume in the tube. First the filament, then the grid, and finally the plate.

Referring to the description of the filament, (see opposite page) it will be understood that the little charges, electrons, fly off the hot filament and travel over to the cold plate. But in doing this they are forced to pass through the fine wires or the perforated gauze which comprises the grid. Some of the charges might succeed in working around the side of the grid, but since they travel with tremendous speed, they naturally seek the shortest line to their objective. Therefore, they pass through the grid or they do not reach the plate.

If the grid is merely a series of cold wires, unconnected to any other elec-

tric source, there is no particular reason why all the electrons, should not reach the plate. But the grid in a vacuum tube is connected to the aerial. It, therefore, carries an electric current. What happens when these negative electrons strike the grid which is alternately positive and negative? The answer to that question explains the operation of the vacuum tube as a detector.

* * *

What would happen to these electrons if the wave on the grid became positive?

Practically everyone has experimented with a simple magnet of the horse-shoe, or U-shaped, type and remembers that the magnet would attract a pin, but that after the pin had touched the magnet it could not again be attracted. Instead it would be forced away from the magnet when the latter was brought near it. This action is based on the magnetic fact that "likes repel, unlikes attract." When the magnet was first brought near the pin, the latter was neutral, it was neither positive nor negative.

Assuming that the positive pole of the magnet was nearest the pin, the pin would be attracted to the positive pole. But the instant that it touched this pole it, also, became positively charged. If, then, the pin were released and the north, or positive, pole of the magnet again brought near it, the like poles repelled each other.

In the vacuum tube, the same fact holds. The electrons are always negative. If the wave on the grid happened to be positive, the grid would attract the negative electrons and not only allow them to pass through, but would even propel them as they passed. The greater the positive charge on the grid, the faster the electrons could pass to the plate.

* * *

When the wave on the grid changes to negative, what happens?

If the grid is charged with negative electricity, the electrons are prevented from either passing through the fine wires composing the grid or from coming anywhere near it. The heavier the negative charge the more effective the grid in holding back or suppressing the electron flow to the plate.

Emergency Surgery Directed by Radio

By George H. Flint



(Marine Photo Service)

Dr. Michael A. Rebert, surgeon of the steamship "Lone Star State," recently renamed "President Taft," of the United States Lines, giving directions by radio for the treatment of a sick man on a passing vessel.

A RECENT survey of the medical situation in the great fleet of vessels operated by the United States Lines reveals many startling and interesting facts regarding the greatly enhanced service of ship surgeons as a result of wireless communication. To-day, the ship surgeon is not only on duty constantly, caring for the ills of the passengers and crew, but he is being made more and more available for consultation with all vessels within wireless call.

Surgeons of the United States Lines have a more or less ocean-wide practice. In the days before the perfection of wireless, the surgeon confined his activities to the vessel on which he served. Nowadays, however, he is liable to be aroused in the middle of the night to hasten to the wireless room to listen to a diagnosis sent through the ether.

Within the last few years, investigation shows that the surgeons of the United States Lines have been called upon to prescribe for a score or more cases which were brought to them through the medium of wireless. It was aboard the "America," of the

United States Lines, that the first wireless telephone was installed. In two voyages, it was completely demonstrated that it was a success.

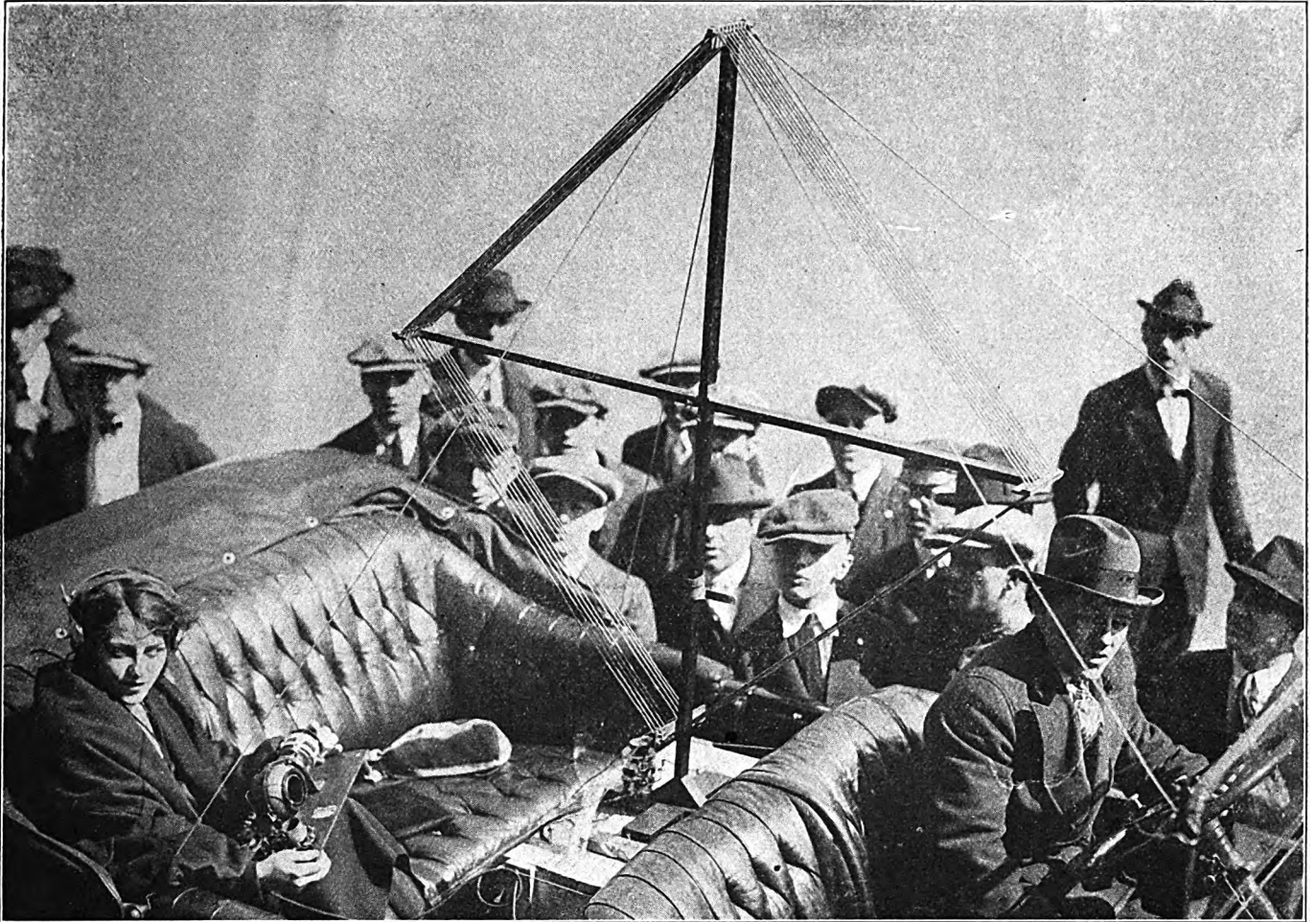
By wireless telephone, the ship's surgeon, Dr. Roy B. Henline, was told one night to give specific directions to a sick captain of a freighter 300 miles away. Dr. Henline had been aroused by the wireless operator and told that the commander of a small freight boat, who believed himself to be dying, decided he needed the services of a physician. Over the wireless telephone, Dr. Henline asked for the man's symptoms. Being informed, the doctor diagnosed the case as ptomaine poisoning. He prescribed remedies normally carried in the medicine chest of all small vessels, and having given his medical advice, retired again. In the morning, he was greeted with a wireless message of thanks from the ptomaine-stricken commander who stated that the remedies prescribed had relieved his trouble.

Among the surgeons of the United States Lines fleet is one who is a pioneer in wireless surgery—Dr. Wil-

liam S. Irwin, of the "Centennial State," which plies between New York and London. Some nine years ago, Dr. Irwin, then serving on a vessel plying between New York and Central American ports, was summoned to the wireless room, one day, and informed that the keeper of a lighthouse on a lonely island in the Caribbean Sea was suffering as a result of an injury to his leg, and that immediate medical attention was necessary. The island had five persons as its population, these being the lighthouse tender, his wife, a wireless operator and two other workmen, one of whom acted as cook.

Dr. Irwin asked for a complete history of the case. Across 800 miles of sea, the details were given him in dots and dashes. The lighthouse keeper had fallen, broken a leg, and gangrene had developed. Dr. Irwin came to the conclusion that immediate amputation was necessary to save the life of the sufferer. It was out of the question for the ship to get to the island, for the surgeon realized that the time consumed would be too great. He inquired whether or not the others on

Motor-Car Radio Making Rapid Strides



(c. Underwood & Underwood)

Now that the out-o'-door days are approaching, radio folk are not packing their receiving sets in moth bags but are putting them to important use. The photograph shows that Miss Shirley Ward had an ambitious set devised for her motor-car. With the aid of a tube in the set, and the batteries—which are on the floor of the car underneath the loop aerial—it should be possible for her to pick up signals.

(Continued from preceding page)

the island would be willing to attempt the necessary amputation, provided he gave them specific directions. Receiving an answer in the affirmative, Dr. Irwin detailed through the ether the process necessary for cutting off the injured man's limb. The surgical portion of the operation was performed by the cook, using as his instruments a butcher's knife and a kitchen saw. Inasmuch as no anesthetics were available, the injured man had to grin and bear it. During the next two or three days, Dr. Irwin received wireless communications regarding the state of the patient and found that, having a robust constitution, he was doing well. Several months thereafter, when Dr. Irwin's vessel was within wireless-talking distance of the island, he communicated with his patient, and found that he was well on the road to recovery. Only a few weeks ago, doctor and patient met for the first time—on the arrival day of the "Centennial State"

in the port of New York. A message that came from the pier informed Dr. Irwin that a man with one leg desired to see him. When Dr. Irwin reached the pier, the one-legged man grasped him by the hand and said, "Doctor, you don't know me; but you should inasmuch as you are responsible for taking off my leg."

Dr. W. S. Ford, of the "Potomac," of the United States Lines, aided and abetted the stork by wireless. Late one night, Dr. Ford was aroused to read a message which came from a freighter in mid-Atlantic which read as follows: "Captain's wife on board. Expect arrival of stork before we can reach port. Please assist." Dr. Ford detailed, in language that could be understood by a layman, the necessary directions to the far-off freighter, over which the stork hovered. Two days later, Dr. Ford received another message which read: "Have a new son. Don't know your first name, doctor, but will call him Napoleon Ford. A thousand thanks. God bless you."

Operated Over 4,200 Miles

Through the daily operation of its Cavite station to Honolulu, a distance of about 4,200 miles, which has maintained a 24-hour a day service for some time, the United States Navy believes it holds a record. Using a 500-kw., arc-transmitter, even San Francisco has heard Cavite's messages. When it does, Honolulu is notified and does not relay the message, as is ordinarily done, in transmitting 7,000 miles over the Pacific.

Recruiting by Radio

The Army Air Service recruiting station at Mitchell Field, N. Y. has adopted a novel plan of recruiting by radiotelephone. A broadcasting message calling for recruits for the Air Service was sent out recently and letters are being received from far and wide, in reply. The latest response came from an applicant in Buffalo, New York. By means of radio and other facilities, twenty-eight recruits were secured.

Design of an Amateur Receiving Set

By C. White

TO fully understand the design of an apparatus of any kind it is necessary to become well acquainted with the principles involved. E. L. Bragdon, in recent issues of *RADIO WORLD*, carefully explained tuning, which is the fundamental theory underlying the reception of radio waves transmitted through the ether. But in order to further augment his discussion, I shall briefly review the entire theory of radio communication.

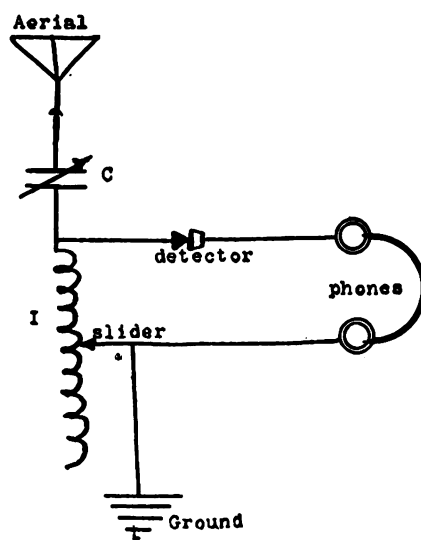
Let us take, first, for our example of radio waves the case of visual disturbance of a smooth, quiet, water surface. If a stone be thrown into a pond of still water, there is immediately sent out from the spot where the stone pierced the water surface, a circular wave or ripple. This wave, impinging on a branch or twig projecting above the water line, is broken, forming another ring around the branch, then reuniting, it progresses onward until it is finally damped out by the resistance offered by the water. Here we have a perfect hydraulic analogy of a radio transmitting and receiving station.

Radio waves travel through the ether at the rate of light, which is 300,000,000 meters per second. If the length of one wave be 300 meters, then the number of waves that will be sent out in one second is 1,000,000. This latter figure is commonly called frequency. But, in wireless, we are accustomed to rate the characteristics of a wave by the wave length, and not the frequency, although, recently, the terms "radio" and "audio frequency" are very common. There is no definite line of demarcation between the two; but it may be stated that the audio-frequency range is from 40 to 10,000 waves (or cycles) per second, while radio frequency ranges from 10,000 to 3,000,000 or more cycles per second. Hence to receive or interpret signals sent out at radio frequency, we must have some method or device to bring such a high pulse within the range of audibility. This purpose is accomplished by the detector.

For a circuit to receive a certain type of wave it must literally offer an "open door," or the wave will not "come in." The tuned circuit is the "open door," and when we tune, which is the adjusting of the relative amounts of inductance and capacity, it is the "opening" which we are trying to accomplish. Suppose the cir-

cuit is tuned and we place our phones across the right part, we hear nothing, because the pulse of vibration is above the range of our ears. But upon introduction of a detector into the phone circuit, the pulse is immediately rendered audible.

To get down to brass tacks, let us study the case of one particular elementary receiver, such as shown in Figure 1. To tune that type of circuit, we can change the value of the capacity and the inductance by mov-



C.—A variable (or fixed) condenser of .001 mfd., or .0005 mfd.

I.—Single coil variable inductance (tuning coil.)

ing the plates of the condenser and the slider on the tuning coil until we get the maximum sound, then finer adjustments can be made on the detector, by searching for a more sensitive spot. Mathematically tuning is nothing more than satisfying the following equation:

$$I \times C = \frac{W \times W}{355 \times 10,000,000}$$

$$\text{or } I \times C = \frac{W^2}{355 \times 10,000,000}$$

I is the inductance in milli-henries.

C represents the capacity in microfarads.

W is the wavelength in meters.

The alert reader will immediately observe from the above formula that there are any number of values of I and C which will satisfy the equation for a certain given value of W, which is fixed by the sending station. Yes, it is quite true, that, from the mathematical standpoint, there is an infinite number of satisfying possibilities; but, on the other hand, from the practical standpoint, there are only a few good solutions.

It is this fact that allows considerable flexibility in design and construction. Now, for example, say we wished to build a set of the type illustrated, capable of receiving a maximum wave-length of 595 meters. We are also limited by the fact that the maximum capacity of a 43-plate variable condenser is .001 (1/100) microfarad. Substituting 595 for W and .001 for C and solving for I, we find that the tuning coil must have an inductance of .1 (1/10) millihenrie. If the maximum capacity available had been .0005 microfarad (i. e. a 23-plate condenser) I would have to be .2 milli-henrie. Of course fixed condensers could be substituted instead of variable condensers, if the designer so desires, without upsetting the mathematical treatment in any way.

After having determined the value of I we can determine with the aid of the following equation, the actual specifications of a single-layer coil:

$$I = \frac{K \times D \times D \times N \times N \times L}{1,000,000}$$

$$\text{or } I = \frac{K \times D^2 \times N^2 \times L}{1,000,000}$$

I is the inductance desired in milli-henries.

D is the diameter of the coil in inches.

N the number of turns of wire per inch, length of the coil.

L the total length of the coil in inches.

K a number depending on the ratio of D/L (given in table).

Ratio: D/L	K
.05 (1/20) or less	25
0.5 (1/2)	21
1.0 (1/1)	17
1.5 (3/2)	15
2.0 (2/1)	13
3.0 (3/1)	11
4.0 (4/1)	9

D the diameter of the coil depends upon the size of the core or tube we are going to use; while N is fixed by the size of the wire to be used and the closeness of the winding.

It is obvious that the only things that are left for us to determine is K and L; for we have previously calculated the value of I which we wish to obtain.

The best way to work the formula is to substitute the value of D and N, which we know from the kind of material we are going to buy or already have, then make a guess at L, and using this guess value for L, determine by means of the table a corresponding number for K. If after solving the formula we find that the answer for I is larger than that we want, it is obvious that our guess for L was too LARGE, and we should make another guess, trying the for-

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Radio Concert for Shut-in Soldiers



(e. Underwood & Underwood)

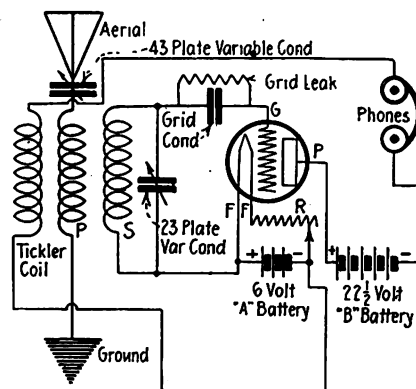
The most elaborate concert ever sent out by radio was one given by four artists at the Naval Station, Anacostia, D. C., for the benefit of the wounded soldiers in the military hospitals at New York, Boston, Philadelphia, Baltimore, Washington, D. C. and Norfolk, Va. The illustration shows the interior of the broadcasting station with the concert players in view. Left to right: Grete von Bayer; Byrd Mock, chairman, concert committee; Adele R. Bush, H. K. Brown, educational director, Marie Howe Spurr, Patricia Ryan, American prima donna, William van Andel, Dutch pianist; Elsa Louise Raner, Polish violinist; Richard Loriebug, Commander Albert Hoyt Taylor, inventor of broadcasting apparatus.

Successful Experimenting with Radio World Stunt

RADIO WORLD No. 5, dated April 29, contained an article, "A Circuit for Amateurs to Experiment With," with an original diagram. The article and diagram were the work of Fred. Chas. Ehlert, of our editorial staff. The diagram described a regenerative circuit employing a tickler coil in the plate circuit. It was self-explanatory. Mr. J. J. Casmay, a RADIO WORLD subscriber, who asks us to withhold his address, tried the experiment. That he was unusually successful, is shown by his letter which follows:

Editor, RADIO WORLD: Referring to Mr. Ehlert's diagram in RADIO WORLD No. 5 dated April 29, I wish to state that his regeneration circuit worked with remarkable results. The set was constructed by

myself as described, and, when finished, I heard WJZ, KDKA, 2 BX, 2 BML, XFI, and others in the 1st, 2nd, 3rd, 4th, 8th, and 9th districts. Using 600-meter coils. I heard NAM, NAX, WCC, NCZ, NBD, NAN, NAH, and others, I also heard the



Circuit employing tickler coil set to produce regeneration. Drawn by S. Newman.

steamer "Sunbeam" entering the English Channel. I used a 65-foot 4-wire antenna and 3 stages of amplification.

The same night the steamer "Anetta" was copied off the Florida Coast. Then I used a V.T.-1 J tube. The variable across the grid and filament is essential, as the coils give only a slight increase and decrease of wave length.

If listening to compass stations is desired, the secondary and tickler must be kept close together. Move the primary about 6 inches from the other two coils, and turn the variable to about 80 degrees. This circuit may be doubtful to many, but just try it if you have a good tube that will oscillate, and you will be surprised with the results obtained.—J. J. CASMAY.

Operators who witnessed and copied the above, as well as Mr. Casmay, are 3 AI and 3 OVX.

For the benefit of RADIO WORLD readers who may have overlooked this experiment, we reprint both circuits in this issue—one on our front cover and the other herewith.

(Continued from preceding page)
mula again. If the second guess make I come out smaller than desired, then we are assured that the right value of L lies between the two guesses. On the third guess, one can always hit close enough to approximate the length the coil should have.

Suppose we want to design a coil to have a maximum inductance of .2 milli-henries. The coil is to be wound on a 2-inch tube with wire capable of having 20 turns to an inch, thus making our value of D equal to 2 and N equal to 20. Next, let us guess 10 inches for L, and, by using the table, we can see that the nearest value of K is 25 approximately. Then if we

make the above substitutions in the equation, I will come out to be about .4 millihenries, which is too large. Now we must try another value of L which is smaller than 10, let's say 6 inches. Our value for D and N will be the same as before, but L will be 6 and K (from the nearest number corresponding to the ratio 2/6) will be 21. On using these numbers in the formula, we find that I comes out about .2 milli-henries, just the amount we wanted. Thus showing that very often one can guess close enough to the right value of L on the second trial.

In design work we should always add a little more to the results we get

by formula so as to allow for slight error, not only in approximate formula, but also in the actual carrying out of the construction work.

Take, for instance, the problem just solved, it would be far better to make the coil 7 inches long than 6 inches; because, by so doing, we actually know that we are on the safe side of the fence. Again, always design for the critical condition, which in the problem just set forth was the maximum wave-length that it was desired to receive, and not the minimum. A bridge designer always designs the bridge to carry the maximum load, when he knows that smaller loads can be handled safely.

Will Radio Replace the Phonograph Will Radio Keep People from Church Will Radio Hurt the Theaters Will Radio Increase Authors' Royalties



By Everett Ewing

ATITANIC interrogation point, reaching from horizon to zenith, thrown suddenly across the sky by some powerful and little understood force, might startle more persons than have been amazed by the phenomenal development of the radiotelephone.

But it is unlikely that it could start more inquiry or create greater interest.

Questions are being asked—some for information merely; others aiming for early installation of receiving sets that the benefits of the wireless telephone may be had. These questions are being hurled at electrical-supply dealers, electrical manufacturers, amateur radio-experimenters, scientists, inventors.

Another class of questions come from those who are not certain that their sources of income will not be affected. The economic phase of the communications revolution has them puzzled.

Manufacturers of phonographs, talking machines, voice and music reproducing records; manufacturers of player-pianos and of other musical instruments; writers of songs, music composers; preachers, lecturers, and other platform artists—all are among those who see the bread-and-butter side of the problem that has come out of the air. They do not know the answers—yet. Here are just a few of the questions:

Will the radiotelephone take the place of the phonograph as an agency for entertainment in the home?

Will broadcasting sermons keep people from attending church services.

Will broadcasting popular music decrease the royalties of the song writers and composers?

What will happen to the income of artists in grand opera? To principals and chorus in musical productions? To vaudeville stars?

What will be the effect on box-office receipts of theaters presenting such entertainment?

Can manufacturers prevent the broadcasting of what appears competitive entertainment?

Should preachers keep transmitting equipment out of their churches?

Will song writers and composers be able to compel makers of radio equipment to pay them for the use of their words and music?

How will the radiophone's popularity affect the opera stars, the musical-comedy players and the vaudeville folk?

How about the theater's future?

How long will this radio craze last?

These and scores of other questions are being asked.

A titanic interrogation point seems to have been thrown across the sky with startling suddenness.

* * *

Last Armistice Day, after elaborate preparations had been made to perform a latter-day-magic feat, President Harding spoke to a throng estimated at a hundred thousand, in Arlington Cemetery, Washington, D. C., and his words were carried by long-distance telephone connections to 30,000 persons in New York City and to 20,000 more in San Francisco. Amplifiers and repeating units at points along the circuit from Washington to New York, and to San Francisco, produced the miracle of carrying the President's voice across the continent in less than one-fiftieth of a second!

That, little more than four months ago, was hailed the acme of achievement. The pinnacle of progress, in communication at least, had been reached.

With such equipment, it was frankly forecast, the President of the United States might, if he so desires, talk from the White House to gatherings assembled in every State in the Union. The head of any vast organization might speak to its every member scattered throughout the nation, and hundreds of miles apart—speak once and be heard many times, each time at some point on the circuit.

* * *

To-day, no such elaborate hooking up of circuit, installation of amplifiers and use of repeating units are necessary—no great and expansive system of wires.

To-day, such widespread communication is possible without wires—save the short lengths used as antenna or aerials, or in the coils in the little

boxes which transform vibrations caught from the air to the voice or sound waves sent broadcast on what is known as a wave length.

Great broadcasting stations have been established—some of them have been broadcasting a daily program regularly for more than a year. At first, enthusiastic amateur radio-operators and electrical experimenters formed the audiences. Their numbers grew steadily. Many of them were boys who caught the voices—the musical and other sounds. They interested adult friends and parents in their experiments. For a time the radio sets were looked upon as toys—entertaining, amusing toys.

Manufacturers of receiving sets, having wider range than the crude equipment many youngsters possessed, arranged better programs—interested noted singers, lecturers, preachers, in participating in the giving of wireless entertainment, instruction, and information—and sent them broadcast.

The receiving set found its way into the homes of business and professional men who found the novelty of it all to be refreshing and restful. The tired business man, after supper and his evening paper, lighted pipe or cigar, comfortably settled himself before his receiver set, lighted its bulbs, turned a knob or two, not unlike those on safe combinations, until a whistling sound was heard. Then, giving the receiver's "tickler" a twirl or two, he sat back to smoke and listen. With the few slight, simple movements, he had swung in on the wave length of Pittsburgh, of Chicago, of Newark, or Springfield, Massachusetts, or one of the other broadcasting stations.

Perhaps it was Pittsburgh he caught first. Perhaps the program there was not to his liking. All right. He could get what he did like. Simple movements of knob on dial "cut out" Pittsburgh, and "cut in" on Chicago's wave length, or Newark's, or Springfield's. "Ah! that's more like it," he'd decide.

Music—the violin — *Humoresque*. A pipe organ, full, rich, mellow—"The Pilgrims' Chorus".

And then comes the New York

(Continued from preceding page)

stock review; the cotton market; other market news and views; government statements; the weather forecast. And as the broadcaster swings through his schedule into agricultural information, more interesting to the farmer than to him, the tired business man "cuts out." He wants to hear *Humoresque* again. He crosses the room to the record cabinet, finds the number, places it on the machine and, starting the motor, his phonograph plays the encore.

* * *

Right there is the answer to the talking-machine maker's question. Music that comes in over the wireless does not remain, to be tapped at will. Music that comes from the record is, in a measure, permanent. The appetite, awakened by the radiophone, is appeased by the phonograph.

In the case of sermons, the answer is similar. The central idea is much the same:

Reverend Stuart Nye Hutchison, pastor of East Liberty Presbyterian Church, Pittsburgh, one of the preachers whose sermons have been broadcasted and who, through the receiver he has installed in his Pittsburgh home, has heard the preaching of others, is enthusiastic for the broadcasting of sermons. While visiting a former charge at Norfolk to conduct a week's series of Lenten services, Dr. Hutchison declared:

"Broadcasting sermons is going to prove a good thing for the church. It is going to interest them in the church, awaken a desire to attend services, and increase the sizes of congregations. When his sermon is sent broadcast, a preacher is heard by half a million people. I know of no other way such a vast audience can be reached."

Churches are not likely to reject so powerful an ally as the radiotelephone.

Artists in the opera, in musical comedy *revues* and vaudeville, whose work is reproduced on the phonograph, draw royalties from the record manufacturers. These have nothing to lose in contributing their services to the broadcasters, when consideration is given the fact that, by wireless, they are heard by an ever-growing audience in which are many who have never before heard them. These hearers are potential purchasers of the discs preserving their voices. That which pleases creates desire for further enjoyment.

* * *

Song writers and composers present the most difficult of the many questions, or so it seems to-day, for

Use Radio in Mimic Warfare



(c. Underwood & Underwood)

The military review of the Lane High School, Chicago, was conducted by its students entirely through radio service. Major E. S. Pearsall gave orders in his office which were transmitted direct to the field of battle, and from there relayed to the field officer through a megaphone. The photograph shows the receiving set, antenna, and megaphone of the student officers.

they actually are, or have been, in conference with the leading receiving apparatus manufacturers who are the most prominent broadcasters. The purpose of these conferences is the reaching of some understanding with reference to payment for the use of their songs.

Musical productions, vaudeville acts, and other vocal entertainment management afford the song writers a certain protection of their rights in the music sung at the shows. Royalties are fattened for the authors—directly and indirectly. People "out front" hear and like the songs; the airs stand by, they can be whistled. And, in a day or so, those persons are to be found buying the music they whistle.

So, after all, the song writer's royalty problem may not be so difficult as the song writers think. Chances are that it will solve itself. Hearing the song *via* wireless cer-

tainly should make as pleasing an impression as hearing it across the footlights. Increased sales of meritorious work would seem in natural sequence.

* * *

Need the theater worry about the future? The theater advertises; believes in advertising—if the display columns of newspaper amusement pages form any sort of a gauge. Pick up any paper. Turn to the amusement pages. Accompanying, or somewhere near, the theater's paid announcement is a story of the play, or a review. Often the article tells the whole thing—even "gives away" the point the production hinges upon—the climax; makes plain the most tense situation; tells where lies the suspense and the secret of interest.

That doesn't hurt the "show;" doesn't curtail attendance. On the contrary, box-office receipts are swelled. The people want to see what they have read or heard about.

The principle is the same as going to a fire, or to see where a wreck occurred. The most central point in the United States, psychologically, cannot be elsewhere than "in Missouri"—which is where, figuratively, most of us are from.

The future of the theater appears safe enough. Under the curiosity-impelling influence of the radiophone, the theatre should thrive.

* * *

The radiotelephone is in its infancy. It is still in crude shape, wonderful as it appears to be. The radiotelephone is an improvement on the wireless telegraph, just as wire communication was improved when the human voice, instead of "dots and dashes" alone, could be flashed over it. Possibilities with the radiotelephone are limitless.

Inventive genius and scientific mind are probing those possibilities now, and discoveries are being made so rapidly that they fairly daze the layman.

Radiotelephony owes its tremendous popularity to-day to the fact that it is pliable in the hands of those who have little or no technical knowledge of electricity. Any one of average intelligence possessing a receiving set can tune it to the wave length that carries the entertainment, instruction, or information one desires.

The "radio craze," as that term is used, is here to stay. There is no craze in reality. The radiotelephone is not a fad—it has passed the toy stage. It is practical and most useful, and with vast powers inherent, gives promise of becoming the one great agency that answers not only the questions it has prompted but many other and graver questions.

Radio Merchandising

The Service Radio World Gives

LET RADIO WORLD be your amplifier. Its advertising columns will broadcast your trade message to over 70,000 radio buyers every week.

Without cost, **RADIO WORLD** is prepared to render the following valuable service:

Giving technical advice and suggestions by radio experts.

Preparing advertising copy.

Attending to all the details of making proper cuts or illustrations.

Selecting right type to give pleasing typographic effect to advertising copy.

Suggesting reliable advertising agents.

A quick, reliable printer. A successful experienced man to prepare

your catalogues, booklets, leaflets, and other literature, relieving a busy manufacturer of all such details.

Suggesting an expert to write your circular letters.

RADIO WORLD even knows of some capitalists willing to put substantial backing in promising radio ventures.

RADIO WORLD's mission is to inform, amuse the radio fan; to serve, assist, and bring profitable results to manufacturers and radio distributors who use its advertising columns.

For quick action and personal service, address **Fred S. Clark, manager, RADIO WORLD, 1493 Broadway, New York, N. Y.**

Communicate with Them

Editor, **RADIO WORLD**: I want addresses of firms, that are manufacturing radio sets, and selling to dealers. The writer would like to get in touch with such firms selling on a commission basis.—**E. M. Kennedy, 989 Dayton Ave., St. Paul, Minn.**

Editor, **RADIO WORLD**: Would you be kind enough to send me the names of any firms or persons who would sell their radio sets and equipment on the easy-payment plan.—**Arthur Shermaa, 63 Tremont St., Taunton, Mass.**

Editor, **RADIO WORLD**: We are desirous of securing the distribution of a complete radio outfit, and would appreciate your furnishing us with the names and addresses of manufacturers that are producing crystal and tube sets.—**The Van Kerr Co., 5 Columbus Circle, New York, N. Y.**

De Forest President Predicts Radio Success

THOSE who see in the present radio development no more than a boom period, hold views that are not in accord with Charles Gilbert, president and general manager of the De Forest Radio Telephone and Telegraph Company. This company recently completed plans for moving the De Forest Laboratories and factory from the small High Bridge station, New York City, to new and greatly enlarged quarters at Jersey City, N. J.

"Only the surface has so far been scratched," says Mr. Gilbert. "I make this statement after a careful study of the experience which the De Forest Company has had, going back a number of years.

"There had been many indications that the public would awaken to a full realization of the possibilities of the radio art; but, apparently, the time had not arrived when people were ready to recognize what could be done with radio apparatus.

"With the present widespread use of broadcasting, however, and with a knowledge on the part of the public of what can be done in the way of receiving news, music, and educational information, radio will never be permitted to lapse back into its previous dormant state.

"Just what particular line of development the art will follow, it is hard to say. The De Forest Company is establishing itself for a continuous and permanent growth, however with the feeling that radio will play each year an increasingly more important part in the life of this and other nations."

The recently acquired property of the De Forest Company in Jersey City is the former plant of the Franco-American Food Company, at Central Avenue and Franklin Street, covering an entire city block, with 32,000 square feet available for immediate use.

Editor, **RADIO WORLD**: We have a live-wire high-pressure sales force and are anxious to secure a complete radio line for distribution in Chicago territory. A live-wire house that can make prompt deliveries, can secure real distribution through us in the Chicago territory. Let us hear from you at once.—**Old Line Agency Company, American Bond and Mortgage Building, Chicago. Thomas Connelly, manager.**

Don't Be Afraid to Buy Good Sets

Time was, on meeting Bill. I'd ask, "What's the news?" Now that I have a radio set, I tell Bill the news.

Every "live wire" should have a radio in his home. Conan Doyle tells us even the "dead ones" use radio. He suspects the messages that spiritists receive from the other world are in regard to radio. But it takes a good medium to receive them.

Radio material is now more plentiful. A smart boy can get all the necessary material to build a practical outfit consisting of tuner, detector, and telephones for about \$20. A crystal set complete, having an auditory range under favorable conditions of fifteen to twenty miles, costs about \$25.

A real good vacuum-tube outfit with amplifier, so that a whole family may enjoy distinctly received messages from a broadcasting station, could be put up for \$40 up. Enjoying radio is like motoring in regard to its cost. One gets in motoring the same exhilaration, good fresh air, and the same beauty of scenery, whether he be in a Ford or a Rolls-Royce, and so, your radio-receiving set, like the motorcar, is largely a matter of personal taste and what you can afford. If I could afford a three-hundred dollar radio outfit, I certainly would not buy a thirty-dollar one. On the other hand, if \$30 were all I could afford at the moment, that is the price I would pay. I would not miss the entertainment, information, and fun, I could give my family and myself now, with the low-price radio outfits, simply in the hope that I might be able to buy a better one later.

SUBSCRIPTION BLANK



RADIO WORLD CO.,

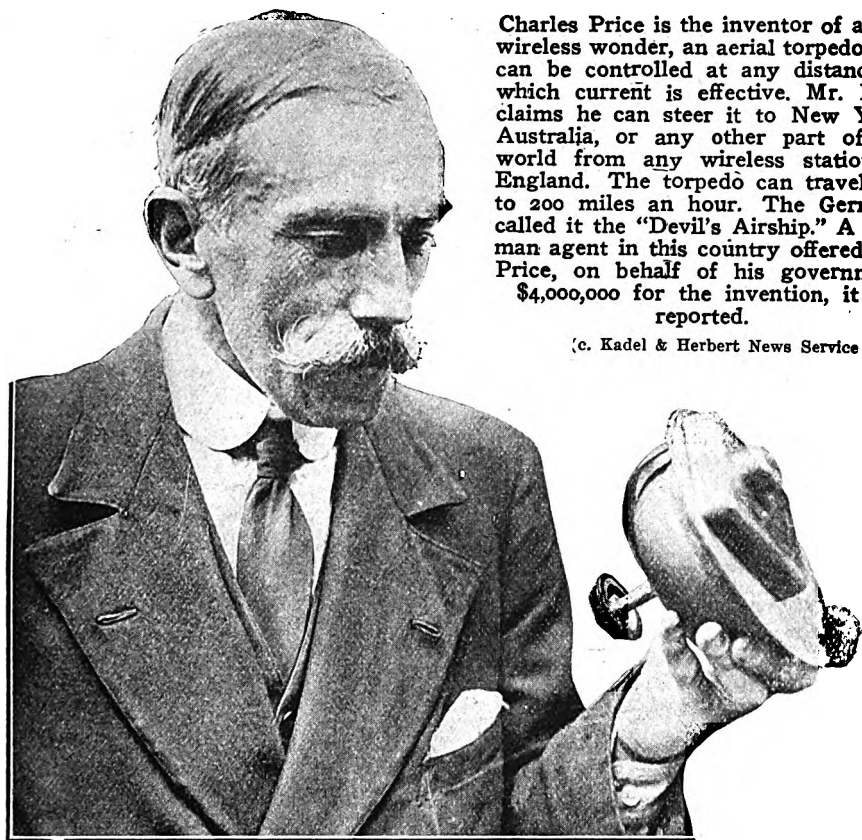
1493 Broadway, New York City.

Please send me **RADIO WORLD** for.....months, for which
please find enclosed \$.....

SUBSCRIPTION RATES:

Single Copy\$.15
Three Months 1.50
Six Months 3.00
One Year (52 issues).. 6.00
Add \$1.00 a Year for Foreign
and Canadian Postage.

Inventor Says He Can Steer Torpedo by Radio from England to New York



Charles Price is the inventor of a new wireless wonder, an aerial torpedo that can be controlled at any distance to which current is effective. Mr. Price claims he can steer it to New York, Australia, or any other part of the world from any wireless station in England. The torpedo can travel 175 to 200 miles an hour. The Germans called it the "Devil's Airship." A German agent in this country offered Mr. Price, on behalf of his government, \$4,000,000 for the invention, it is reported.

(c. Kadel & Herbert News Service)

New Radio Firms and Corporations

THERE were filed with the Secretary of State of New York, at Albany, during April, the papers of fifty-six corporations dealing in radio apparatus. Their aggregate capitalization is \$1,759,600. The number of incorporations in April was 1,534, as compared with 1,717 in March. All but 238 of the companies incorporated in April are located in New York City.

RADIO WORLD receives many requests for the addresses of the new corporations published in its merchandising department. So far as is possible, the addresses of the lawyers of these firms are given. Address your communications to them.

Multiple Storage Battery Corp., 350 Madison Ave., New York, N. Y.
Mook Electric Co., 342 North Avenue, New Rochelle, N. Y.
R. Goldman, 12 North Ave., New Rochelle, N. Y.
W. C. Poellnitz, 89 North Ave., New Rochelle, N. Y.
Cleartone Radio Sales Co., 1607 First National Bank Bldg., Detroit.
The Stine Screw Holes Co., Waterbury, Conn.
Rokay Electric Co., Ingomar, O.
Midget Radio Co., 211 N. Jackson St., West Frankfort, Ill.
Harry B. Reinhart, Oxford and 24th Sts., Philadelphia. Opened a radio department for amateurs only.

The Ogden Wireless Laboratories, 1012 Ogden Ave., New York, N. Y.

Philadelphia Wireless Sales Corp., 1533 Pine St., Philadelphia.

H. C. Spratley Co., 357 Main St., Poughkeepsie, N. Y. Manufacturers and jobbers.

Aerophone Radio Corporation, Wilmington, Del.

Aerophone Radio Corporation, Cincinnati.

United States Radio Corp., Chicago.

World Radio Corporation, St. Louis.

Famous Radio Corporation, Pittsburgh.

Paramount Radio Corporation, Detroit.

Reliance Radio Corporation, Denver, Colorado.

Consolidated Radio Corp., Dallas, Texas.

Amalgamated Radio Corp., St. Paul, Minn.

Broadcast Radio Corporation, Louisville, Ky.

Vytaphone Radio Corporation, Baltimore.

Interstate Radio Co., Manhattan, contracting and electrical work, \$27,000; E. D. Hayward, L. T. McManus, F. Scotts. (Attorneys, McKercher & Link, 40 Rector St., New York.)

Great Eastern Radio Corp., Wilmington, Del., electro or electro magnetic communications, \$2,000,000. (Corporation Trust Co. of America.)

Standard Electric Sales Co., electrical equipment, \$50,000; Wallace L. Fleming, Ross D. Cummings, Harold E. Johnson, Chicago. (Corporation Maintenance and Service Co.)

Scientific Radio Company, Manhattan, radio sets, \$10,000; R. Jones, M. Libby, D.

S. Finck. (Attorney, J. L. Rosenberg, 15 Park Row.)

Glassel Radio Corp., Brooklyn, \$50,000; F. W. Glassel, A. S. Salver, T. C. Tormey. (Attorney, M. H. Winkler, 50 Wall St., New York)

Atlas Radio Corp., operate systems, \$1,000,000; Chas. Graff, Jr., New York. (Registrar & Transfer Co., New York.)

Harriman Radio Manufacturing Corp., install radio apparatus, \$75,000,000; Frederick C. Harriman, Myron Coldsoll, Chas. Freshman, New York. (Colonial Charter Co.)

American Radio News Corp., Manhattan, transmit messages by radio, \$250,000; M. Singer, L. H. Axman, I. W. Hirschfeld. (Attorneys, Eppstein & Axman, 175 5th Ave., New York.)

Broadway Radio Corp., Manhattan, merchandise and electrical works, \$10,000; A. H. Michaels, G. T. Berinati, J. H. Nototny. (Attorneys, Almy, Van Gordon & Evans, 46 Cedar St., New York.)

Radio Course Co., Manhattan, correspondence course, \$5,000; G. Thurston, W. R. McAlevy. (Attorney, J. D. H. Hoyt, 15 East 40th St., New York.)

Radio Board of Commerce

THE National Radio Chamber of Commerce, organized for the purpose of remedying some adverse conditions that have come to the surface in the radio industry—the natural and inevitable result of its rapid growth—and to keep manufacturers in closer touch, held its first meeting at the Hotel Brevoort, New York, on May 5.

Eligibility to membership in the new organization will not depend on the size of a concern but on the quality and dependability of the product manufactured. It is proposed to organize a credit bureau for the interchange of credit information. The following are the officers:

President, Alexander Eisemann, of the Freed-Eisemann Radio Corporation; first vice-president, Randall Keator, of the De Forest Telephone and Telegraph Company; second vice-president, William Dubilier Condenser Company; secretary, Joseph D. R. Freed, of the Freed-Eisemann Radio Corporation, and treasurer, F. Hinners, of the Home Radio Corporation.

Deals Wholesale Only

Editor, RADIO WORLD: Believing that any radio concern, in the best interests of its patrons, should establish itself either as a retail or wholesale business only. The Radio Stores Corporation has given up its retail interests.

We have leased an entire floor at 222 W. 34th Street, New York City, where we will now maintain our warehouse and executive offices. At present we are well stocked and in a position to supply the need of the dealer and distributor exclusively.—Radio Stores Corporation, New York, N. Y., by F. W. Cumming, treasurer.

Coming Events

INTERNATIONAL RADIO SHOW—71st Regiment Armory, 34th St., and Park Ave., New York City. May 22 to 27.

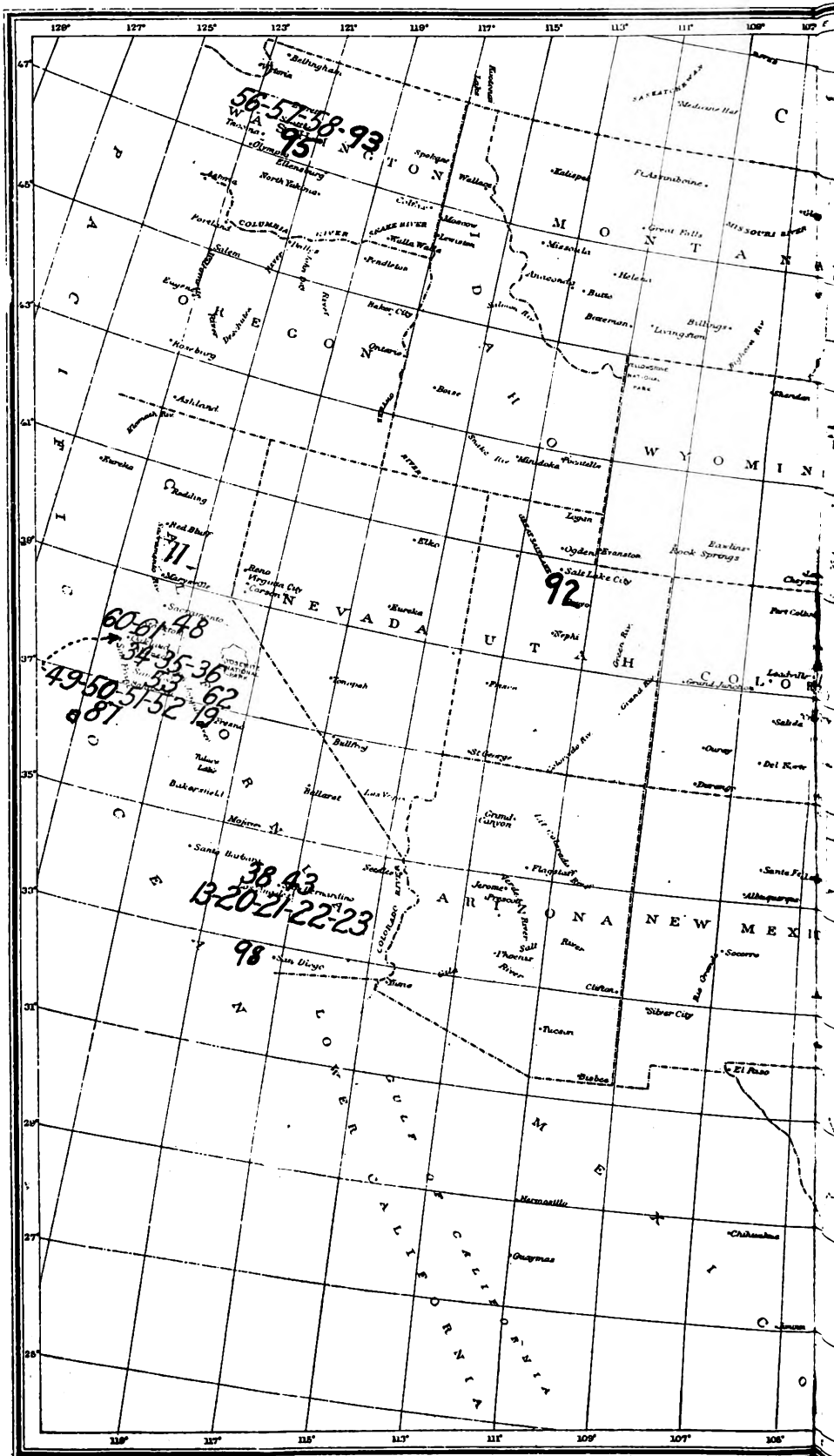
MILO E. WESTBROOKE RADIO SHOW—Leiter Building, Chicago, June 25 to July 1.

CHELSEA RADIO ASSOCIATION SHOW—Hudson Guild, 436 West 27th St., New York City. Evenings of May 26 and 27.

FIRST CENTRAL WEST RADIO SHOW. Auditorium, Milwaukee, Wis. Week of June 21.

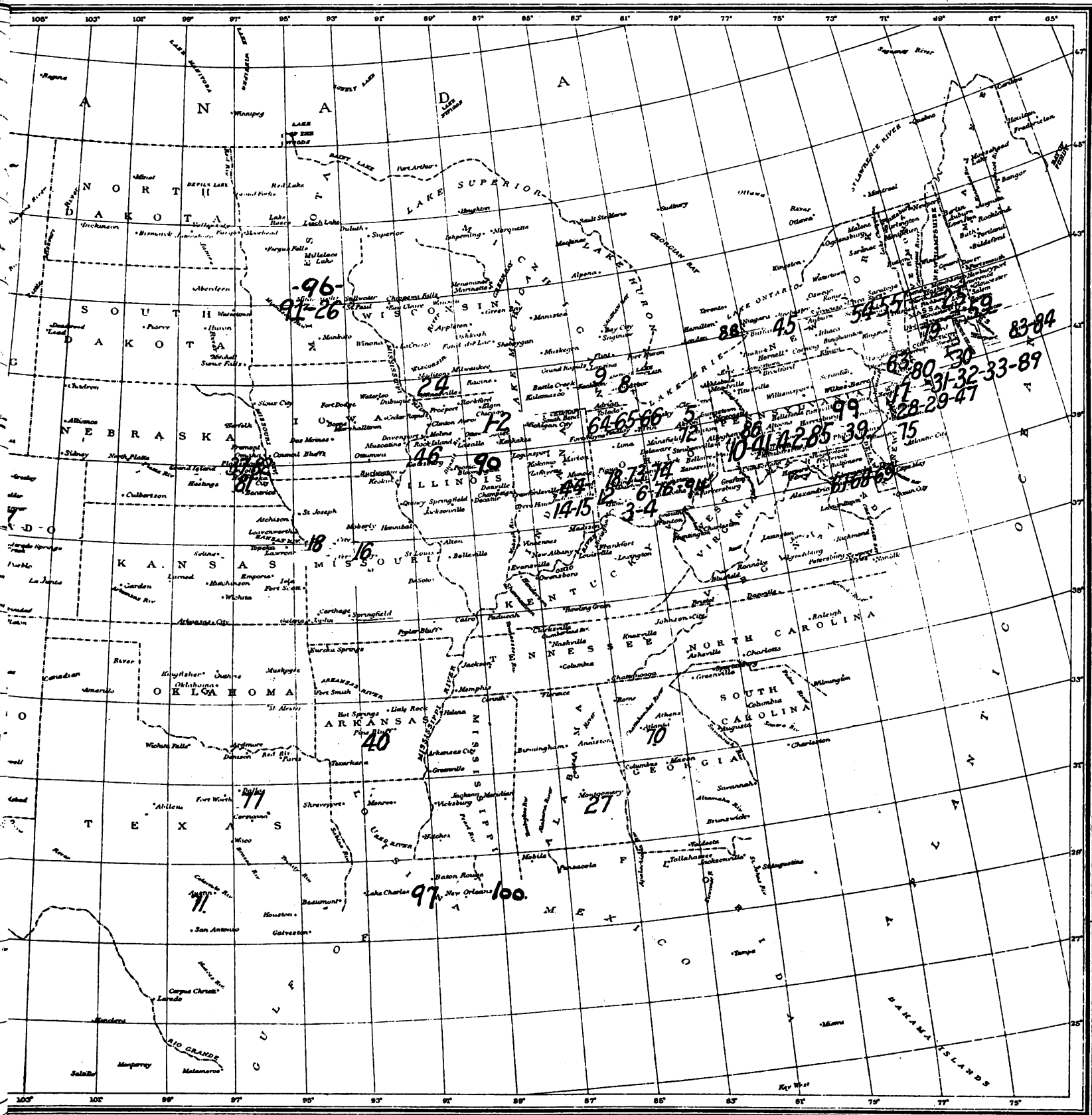
Radio World's Up-to-the-Minute M

Call Letters	Wave Length	Operated By and Location
WBU	360	1 City of Chicago, Chicago
KYW	360	2 Westinghouse Co., Chicago
WMH	360-485	3 Precision Elec. Co., Cincinnati
WLW	360	4 Crosley Manufacturing Co., Cincinnati
WHK	360	5 Warren R. Cox, Cleveland
WFO	366-485	6 Riker Kumlir Co., Dayton
KIZ	360-485	7 Reynolds Radio Co., Denver, Colo.
WWJ	360-485	8 Detroit News Co., Detroit, Mich.
WHW	485	9 Stuart W. Seeley, East Lansing, Mich.
KDKA	360	10 Westinghouse Co., East Pittsburgh, Pa.
KFU	360	11 Precision Shop, Gridley, Cal.
WRK	360	12 Doron Bros. Elec. Co., Hamilton, Ohio
KGC	360	13 Hamilton Mfg. Co., Hollywood, Cal.
WLK	360	14 Hamilton Mfg. Co., Indianapolis
WOH	360	15 Hatfield Electric Co., Indianapolis
WOS	360	16 Mo. State Marketing Bureau, Jefferson City, Mo.
WNO	360	17 Wireless Tel. Co. of Hudson County, N. J.
WOQ	360	18 Western Radio Co., Kansas City, Mo.
KLP	360	19 Colin B. Kennedy, Los Altos, Cal.
KJS	360	20 Bible Institute, Los Angeles
KOL	360	21 Arno A. Kluge, Los Angeles
KYJ	360	22 Leo Meyberg Co., Los Angeles
KOG	360	23 Western Radio Co., Los Angeles
WHA	360-485	24 University of Wisconsin, Madison, Wis.
WGI	360	25 Amer. Radio & Research Corp., Medford Hill-side, Mass.
WLB	360-485	26 University of Minn., Minneapolis, Minn.
WGH	360-485	27 Light and Water Power Co., Montgomery, Ala.
WCR	360	28 Bamberger & Co., Newark, N. J.
WJZ	360	29 Westinghouse Co., Newark, N. J.
WCJ	360	30 A. C. Gilbert Co., New Haven, Conn.
WJX	360	31 De Forest Radio Co., New York City
WDT	360	32 Ship Owners Radio Co., New York City
WVP	1450	33 United States Army, New York City
KZM	360	34 Preston D. Allen, Oakland, Cal.
KZY	360	35 A-P Radio Supplies Co., Oakland, Cal.
KLS	360	36 Warner Bros., Oakland, Cal.
WOU	360-485	37 Metropolitan Utilities, Omaha, Neb.
KLB	360	38 J. J. Dunn & Co., Pasadena, Cal.
WGL	360	39 Thomas J. Howlett, Philadelphia
WOK	360	40 Pine Bluff Co., Pine Bluff, Ark.
KOV	360	41 Doubleday Hill Electric Co., Pittsburgh
WPB	360	42 Hamilton Elec. Co., Pittsburgh
KGF	360	43 Pomona Fixture Co., Pomona, Cal.
WOZ	360-485	44 Palladium Printing Co., Richmond, Ind.
WHO	360-485	45 Rochester Times, Rochester, N. Y.
WOC	360-485	46 Karlowa Radio Co., Rock Island, Ill.
WDY	360	47 Radio Corp. of Amer., Roselle Park, N. J.
KVQ	360	48 J. C. Hobrecht, Sacramento, Cal.
KUO	360	49 Examiner Printing Co., San Francisco
KGB	360	50 Edwin L. Lorden, San Francisco
KDN	360	51 Meyberg Co., San Francisco
KYY	360	52 Radio Shop, San Francisco
KOW	360	53 Charles D. Herrold, San Jose, Cal.
WGY	360	54 General Elec. Co., Schenectady, N. Y.
WRL	360	55 Union College, Schenectady, N. Y.
KJR	360	56 Vincent I. Kraft, Seattle, Wash.
KFC	360	57 Northern Radio & Elec. Co., Seattle, Wash.
KHO	360	58 Louis Wassmer, Seattle, Wash.
WBZ	360	59 Westinghouse Co., Springfield, Mass.
KJO	360	60 C. O. Gould, Stockton, Cal.
KWG	360	61 Portable Wireless Co., Stockton, Cal.
KJJ	360	62 Radio Shop, Sunnyvale, Cal.
WRW	360	63 Tarrytown Radio Research Co., Tarrytown, N. Y.
WHU	360	64 William B. Duck Co., Toledo, Ohio
WSZ	360-485	65 Marshall-Gerken Co., Toledo, Ohio
WJK	360	66 Service Radio Equipment Co., Toledo, Ohio
WDM	360	67 Church of the Convent, Washington, D. C.
WDW	360	68 Radio Construction Co., Washington, D. C.
WJH	360	69 White and Boyer, Washington, D. C.
4 CD	200	70 Carter Electric Co., Atlanta, Ga.
5 ZU	200	71 State University, Austin, Texas
8 UX	200	72 Radioart Store, Akron, Ohio
8 BYV	200	73 Columbus Spec. Co., Columbus
8 YO	200	74 Ohio State University, Columbus
2 XJ	Various	75 American Tel. & Tel. Co., Deal Beach, N. J.
WAL	360-485	76 McCook Army Station, Dayton
WRR	450	77 Dallas Texas, Dallas, Texas
WLO	360-450	78 United States Army, Fairfield, Ohio
WQB	360	79 C. D. Tuska & Co., Hartford, Conn.
2 IA	200	80 Jersey Review, Jersey City, N. J.
9 YY	200	81 State University, Lincoln, Neb.
200		82 R. B. Howell, Omaha, Neb.
1 XAD	200	83 Thomas Giffen, Pawtucket, R. I.
10 J	200	84 Robert F. Farnum, Pawtucket, R. I.
WPB	360	85 Newspaper Printing Co., Pittsburgh
WCL	360	86 Philadelphia
360		87 U. S. Govt., Catalina Island, Cal.
360		88 Edward Streigel, Buffalo, N. Y.
360		89 Brooklyn, N. Y.
360		90 Bradley Institute, Peoria, Ill.
WBAE	360	91 Dayton Co., Minneapolis, Minn.
WBAH	360	92 Desert News, Salt Lake City, Utah
KZN	360	93 First Presbyterian Church, Seattle, Wash.
KTW	360	94 Marshall-Gerken Co., Toledo, Ohio
KZC	360	95 Public Market and Dept Stores, Seattle, Wash.
WBAD	360	96 Sterling Elec. Co., Minneapolis, Minn.
WAAC	360	97 Tulane University, New Orleans, La.
KYF	360	98 Thearle Music Co., San Diego, Cal.
360		99 Harrisburg, Pa.
WBAM	360	100 I. B. Rennyson, New Orleans, La.



Save this map and add to it
Government. This

Map of Licensed Broadcasting Stations



Whenever new official stations are established by the United States
news will be published immediately in Radio World.

Musical Artists Entertain Mid-West Fans



(Photo by L. J. Neumann, Cincinnati)

This picture was taken while the broadcasting was in operation. From left to right, the operator, W. M. Knox, R. Gorno, G. Gorno, and Powell Crosley, Jr., owner of the station.

THREE eminent musicians, Romeo Gorno, pianist; Giacinto Gorno, baritone, and William Morgan Knox, violinist, recently entertained thousands of wireless enthusiasts when their music was broadcasted by WLW, operated by the Crosley Manufacturing Company, Cincinnati.

It was one of the highest-class concerts ever "put on" in this part of the United States. Many letters received by the operators of WLW attested

the approval of fans from many points in the Middle-West.

Romeo Gorno, who was born in Cremona, Italy, is known in musical circles of both Europe and the United States. Giacinto Gorno, who was born and educated in Milan, Italy, is one of the most famous baritones in this country. Mr. Knox is a native of Cincinnati; but his musical education was completed at the Royal Conservatory at Antwerp, Belgium.

Nearly 19,000 Transmitting Stations

THE Department of Commerce will soon issue its 19,000th transmitting license. There are now 18,894 stations of various classes entitled to transmit radio signals.

On April 28, the number of amateurs licensed and listed in their nine districts was 15,061, but as these reports come in only monthly, the number has probably already passed 16,000. A survey of all broadcasting licenses gives a total of 212, thirty of which were issued within the last ten days.

The balance of the stations are of course commercial, ship, and special stations, which do not increase as fast as the amateur and the popular broadcasting stations.

Between April 23 and 27, twenty licenses were issued. Among them there were three colleges—James Millikin, Decatur, Illinois; Tulane University, New Orleans; and Bradley Polytechnic, Peoria, Illinois — two newspapers, a church, and another police department, all offering entertainment except the last. The complete list is as follows:

April 24th

WBAE—Bradley Polytechnic Institute, Peoria, Ill.

WBAH—Dayton Company, Minneapolis,

KZN—Deseret News, Salt Lake City,

WBAG—Diamond State Fibre Co., Bridgeport, Pa.

KTW—First Presbyterian Church, Seattle, Washington.

WBA—Marshall Gerkin Co., Toledo,

WBAF—Fred M. Middleton, Moorestown, N. J.

KZC—Public Market and Department Stores Co., Seattle, Wash.

WBAD—Sterling Electric Co. & Journal Printing Co., Minneapolis, Minn.

WBAN—Wireless Phone Corporation, Paterson, N. J.

April 26th

WIZ—Cino Radio Mfg. Co., Cincinnati,

KUY—Coast Radio Company, El Monte, Calif.

WBAK—Pennsylvania State Police, Harrisburg, Pa.

WBAM—I. B. Rennysen, New Orleans, La.

WAAC—Tulane University of Louisiana, New Orleans, La.

April 27th

KNN—Bulldock's, Los Angeles

KSC—Hale & Company, San Jose, Calif.

WBAO—James Millikin University, Decatur, Ill.

KNT—North Coast Products Company, Aberdeen, Wash.

KYF—Thearle Music Company, San Diego, Calif.

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Radio brings it
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tells it

Radio and the Woman

Women Appeal to Broadcasting Stations to Aid Disabled Soldiers---Club Members Expected to Study Radio Technique---How Radio Helped Impoverished Woman---No Objection to Female Operators on Land---All the Latest News Regarding Wireless Activities of Women

By Crystal D. Tector

BROADCASTING stations receive numerous written requests from sympathetic and patriotic women who ask that the needs of disabled soldiers be given full publicity. One woman who has the interest of our boys at heart, suggests that women all over the country engage to hold, at a prearranged time, a radio concert and tea, the proceeds to be devoted to helping these heroes.

A Newark branch of the Y. W. C. A., will give a radio concert this month.

In this department, some weeks ago, I asked when women at the lower end of Fifth Avenue would be heard to the same extent that women at the upper end of the great thoroughfare have been heard from. This query has brought forth the statement that receiving sets have been installed in many Washington Square studios and that women writers and artists are studying radio.

The very latest freak notice to be served on us, is to the effect that an inventor has perfected a machine that will send perfume by wireless. "Can you beat it?"

Mrs. August Belmont is soon to broadcast a talk on the Red Cross. The Westinghouse station will enable her to do this.

Watch this department for future interesting accounts of clever work performed in radio by members of a large organization of young American girls.

Salesmen in a well-known sporting-goods shop which carries a good stock of radio supplies, state that women customers display expert judgment and selection in radio purchases.

Grover Muthersbaug, radio instructor at South High School, Broadway and Fullerton Avenue, Cleveland, Ohio, predicts that his girl

students will be able to receive twelve and send ten words a minute at the end of the term.

One woman writes that since she has taken up the study of radio she has not been to a theatre or a fashion show.

Miss Abby Morrison, expert radio operator and instructor, is writing a book on radio.

At a woman's radio club, the officers of which complain that they have experienced difficulty in getting members to speak freely on technical subjects, a new bylaw has been adopted whereby, at stated intervals, each member is expected to deliver an article on wireless. A good way, it seems to me, to overcome shyness in a girl who hesitates to express herself.

A soft-throated resident of Atlanta, Georgia, tells me that her city has a broadcasting station which has not been particularly successful as yet,

but that when it does arrive at a high point of efficiency, she, in conjunction with many other southern women, will request that speeches and lectures be more numerous than musical programs.

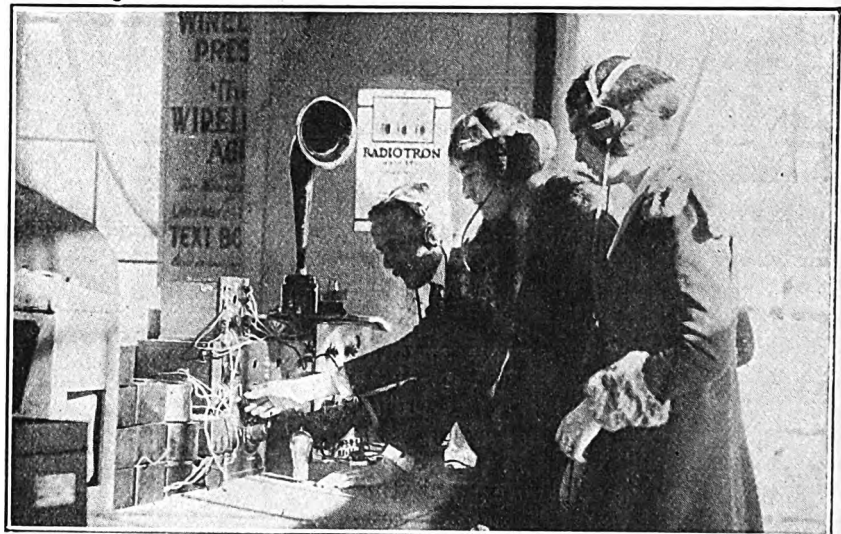
WHN (Ridgewood, Long Island, 360 meters), is devoting the hours of from 9 to 11 o'clock every morning to subjects of direct interest to women. These subjects are, "Hours for Women," including fashion-grams, "Beauty Talks," "Beauty Preparations before Retiring," and health talks.

Officials of the Radio Corporation of America state that though the law of the seas may prevent women from holding positions as wireless operators aboard ship, no such scruples regarding employment on land stands between them and a girl who proves her fitness for the work.

Women of Selma, Alabama and vicinity, listen in on programs broadcast from Chicago and Pittsburg.

An interesting tale of an invalid who had been left alone in the world, with small means of support, came to light recently.

Lonely hours filled with thoughts of future and troublesome efforts to make ends meet, prompted her to look about for employment. After a fruitless search for work, the idea came to her to send out personal letters to mothers living in or near her neighborhood, stating that, for a certain sum she would assume the responsi-



(c. Keystone View Co.)

Amateur radio shows are quite a fad nowadays in the big New York hotels. Recently one was held in The Pennsylvania, when a number of young women were instructed in the mysteries of radio. In the photograph, from left to right are: N. R. Keller, demonstrator; Miss Ethel Gladwin and Miss Gladys Callagy learning how to operate a receiving set.

bility and care of their children during hours when it would be convenient to the mothers to leave them with her. Such success followed this venture that the invalid was enabled to install a radio-receiving set to help amuse the children.

She tells me that though she provides care for those kiddies, she has the broadcasting stations to thank for keeping them contented.

* * *

What a novelty it is to be entertained without having to pay war tax!

* * *

So that their summer camp shall not lack the benefits to be derived from radio, a number of girl vacationists have started to raise a fund which will enable them to install a receiving set.

* * *

It is well worth rising at 9 o'clock in the morning to hear WHN at Ridgewood, Long Island sends out its "Hours for Women."

* * *

To Miss Nellie Hoover, student in the Peabody High School of Pittsburgh, fell the honor of explaining to thousands of listeners in, how the Junior Civic Club benefits school and community and prepares the student for future duties.

This honor came to her as a result of a competition to determine which member the club should speak for the organization, by radio.

* * *

A dear old gentlewoman of Flushing, Long Island, combines her love for children with her interest in wireless when she invites all the kiddies she knows, to come to her between two and three o'clock each day and listen in on her receiving set.

* * *

Above the howl of masculine protests uttered in Washington against taking navy radio out of politics, rises Miss Alice Robertson's approval, clear, firm and decisive:

"I always doubted the advisability of using government radio stations for broadcasting political talks," she says, "the idea of allowing *no one* to use them for this purpose is right."

* * *

According to a statement made in a recent address by Edward T. Black, head of the engineering department of the United Y. M. C. A., Schools, a number of women students have enrolled in the radio extension courses of that organization.

* * *

As an inducement to the feminine taste and beauty-loving eye, a firm just off Park Place, New York City, is displaying attractive receiving sets



(c. International)

"This is the sort of concert you can attend without having to remove your hat and veil," says Lois Wilson, of the motion pictures, as she smiles at you from the improvised receiving station in the studio where she works

with woodwork of bird's-eye maple and others made of mahogany. Nothing but the polished surface and the dials are conspicuously in evidence. "Boudoir sets" is the name the designer applies to them.

* * *

Miss Alice Paul, vice-president of the National Women's Party, sent the news of the dedication of the new national headquarters building at Washington, D. C., by radio.

* * *

This bit of laughter is from one of my recent communications: "The other night, while dressing for a party, I said to my husband, 'John, hook up!' I meant my dress, of course,

but John dashed into the living room and the next thing I knew music was coming through the receiving set."

* * *

In a letter to a radio publication, a woman criticizes the editor in no gentle tones because, as she claims, the press has placed too little stress on the seriousness with which women take radio—that is considered naught but a pastime for them though many are studying it with dead-in-earnest interest in the hope of making it their business. I back up this view. Radio will give many women an opportunity to earn a living. There will be many positions which they will fill to better advantage than men.

Keeping Tabs on the Game by Radio



(c. Kadel & Herbert News Service)

A wire attached to the antenna of the building, in the photograph, and connected with the radio set on the ground, permits Robert Koerner, an up-to-date New York boy, to give his pals the latest baseball scores as they are broadcast. The score-board records the runs made up to the fourth inning in a National League game.

Answers to Readers

IN RADIO WORLD, No. 5, dated April 29, page 27, there is a diagram of a long-wave receiver. As I am interested in such a set, I would like to know if the variable condenser which shunts the tickler coil is a 43-plate or a 23-plate condenser?—James T. Deasy, Glen Cove, L. I.

The condenser you mention is a 43-plate condenser.

Would it be possible for me to use a U-V 201 amplifying tube in the detector-tube socket and make it act as a detector?—Louis Hansen, Charlotte, N. C.

The U-V 201 is an amplifying tube and will not work as a detector. The tubes will function fairly well with a varied plate-voltage of some 35 to 40 volts. If possible secure a detector tube.

How much and what size wire will it take to rewind a single-magnet 75-ohm receiver and a double-magnet receiver in order to receive the messages as a standard 2,000-ohm receiver.—W. S. A., Tarrytown, N. Y.

Get in touch with some telephone company and see if they will sell you some of their special No. 34 B. & S., gauge single silk-covered or enamelled wire, which is used exclusively for telephone-receiver magnet-winding.

What should be the resistance of a pair of telephones suitable for receiving the radiophone concerts?—M. E. E., Woodhaven, N. Y.

Resistance should be from 500 to 2,000 ohms. The 2,000-ohm receivers are standard for radio reception. These may be purchased at any store that sells radio apparatus.

How many plates should be used in a variable condenser for inserting with antenna?—Charles Morelack, Bethlehem, Pa.

Use a 43-plate variable condenser which, if inserted in series with antenna, will cut down the wave length. A smaller condenser will cut down the wave too much and decrease the signal strength.

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Fire Underwriters Modify Radio Rules Amateurs! This Is Important!

THE widespread installation of radio receiving-sets has necessitated a revision of the fire regulations created by the National Board of Fire Underwriters. Through its bulletin, "Safeguarding America Against Fire," new and important fire-prevention rules of vital interest to all having radio receiving-sets, are made public. These specifications, which RADIO WORLD publishes in full, were drawn up by a special committee of the National Fire Protection Association, the authority for the National Electrical Code, whose findings are standards of engineering practice. Besides the underwriting organizations represented, engineers acting for the American Radio Relay League, American Telephone and Telegraph Company, Radio Corporation of America, and the Independent Telephone Association also participated.

The Underwriters state, in their bulletin, that a receiving set having an indoor antenna is considered devoid of hazard. With any receiving set, the principal danger is from lightning brought in through the antenna to the equipment or to some part of the building. Where there is no exterior antenna, this danger is removed.

The following specifications are for receiving stations only:

Antenna

a. Antenna outside of buildings shall not cross over or under electric light or power wires of any circuit carrying current of more than six hundred volts or railway, trolley or feed wires, nor shall it be so located that a failure of either antenna or of the above mentioned electric light or power wires can result in a contact between the antenna and such electric light or power wires.

Antenna shall be constructed and installed in a strong and durable manner and shall be so located as to prevent accidental contact with light and power wires by sagging or swinging.

Splices and joints in the antenna span, unless made with approved clamps or splicing devices, shall be soldered.

Antenna installed, inside of buildings are not covered by the above specifications.

Lead-in Wires

b. Lead-in wires shall be of copper, approved copper-clad steel or other approved metal which will not corrode excessively, and in no case shall they be smaller than No. 14 B. & S. gage except that approved copper-clad steel not less than No. 17 B. & S. gage may be used.

Lead-in wires on the outside of buildings shall not come nearer than four (4) feet to electric light and power wires unless separated therefrom by a continuous

and firmly fixed non-conductor that will maintain permanent separation. The non-conductor shall be in addition to any insulation on the wire.

Lead-in wires shall enter building through a noncombustible, non-absorptive insulative bushing.

Protective Device

c. Each lead-in wire shall be provided with an approved protective device properly connected and located (inside or outside the building) as near as practicable to the point where the wire enters the building. The protector shall not be placed in the immediate vicinity of easily ignitable stuff, or where exposed to inflammable gases, or dust, or flying of combustible materials.

The protective device shall be an approved lightning arrester which will operate at a potential of five hundred (500) volts or more.

The use of an antenna grounding switch is desirable, but does not obviate the necessity for the approved protective device required in this section. The antenna grounding switch if installed shall, in its closed position, form a shunt around the protective device.

Protective Ground Wire

d. The ground wire may be bare or insulated and shall be of copper or approved copper-clad steel. If of copper the ground wire shall be not smaller than No. 14 B. & S. gage, and if approved copper-clad steel it shall be not smaller than No. 17 B. & S. gage. The ground wire shall be run in as straight a line as possible to a good permanent ground. Preference shall be given to water piping. Gas piping shall not be used for grounding protective devices. Other permissible grounds are grounded steel frames of buildings or other grounded metallic work in the building and artificial grounds such as driven pipes, plates, cones.

The ground wire shall be protected against mechanical injury. An approved clamp shall be used wherever the ground wire is connected to pipes or piping.

Wires Inside Buildings

e. Wires inside buildings shall be securely fastened in a workmanlike manner and shall not come nearer than two (2) inches to any electric light or power wire unless separated therefrom by some continuous and firmly fixed non-conductor making a permanent separation. This non-conductor shall be in addition to any regular insulation on the wire. Porcelain tubing or approved flexible tubing may be used for encasing wires to comply with this rule.

f. The ground conductor may be run inside or outside of building. When receiving equipment ground wire is run in full compliance with rules for Protective Ground Wire, in Section d., it may be used as the ground conductor for the protective device.

Solved!

By Kathleen Mather

I sure did feel quite in despair
At the radio talks everywhere,
Till the RADIO WORLD

All the secrets unfurled—
And, now, I'm quite "up in the air."

A European Receiving Set for Radio



(c. Wide World Photos)

This is the new Marconi receiver designed to make it possible for the average householder to enjoy the advantages of wireless in the home without much structural work and expense. The photograph shows a detector and two-step amplifier which can be very easily seen, and of course necessary inductances and capacities for the various wave lengths.

"Radio Mush" Out of Navy Menu

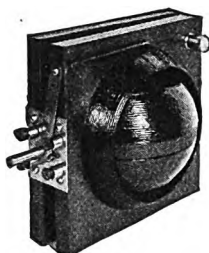
RECENT experiments conducted at the Mare Island Naval Radio Station, San Francisco, it is reported, have eliminated "mush" and harmonic interference by means of a current transformer.

This current transformer, installed with the 30- and 100-kw. arcs at the low and high power stations in Mare Island, has proven entirely satisfactory, in eliminating the arc "mush" and harmonics which had been interfering with receiving thereabouts. About a week ago, tests were conducted with the co-operation of commercial stations in the vicinity, and a summary of the reports received showed that these companies experienced no interference while the high-power arcs at the Naval stations were in operation.

"Mush" is known as oscillations other than the true wave, which act as a sort of "wet blanket" over incoming signals being received at a neighboring station. Actually, it is composed of small and sudden irregularities in the antenna current of arc transmitters. Previously, it has been practically impossible to tune out the so-called "mush."

The harmonic of a wave is also troublesome, as it is a wave whose frequency is a multiple of that of the original wave; its wave length being a sub-multiple of the length of the given wave.

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This Boy Broke Radiophone Record



(c. International)

Harrison Holliway, 19 years old, of San Francisco, recently shattered the Pacific Coast long-distance radiophone record, by reaching Vancouver, British Columbia, and Launga Beach, Orange County, California. Young Holliway has been a "wireless wiz" since his boyhood. For several years he operated a station at his home, officially licensed under the United States Department of Commerce as 6 BN. The entire equipment of his station including the wireless apparatus was installed by himself and his chum, Harold R. Shaw.

AS TO BACK NUMBERS OF RADIO WORLD

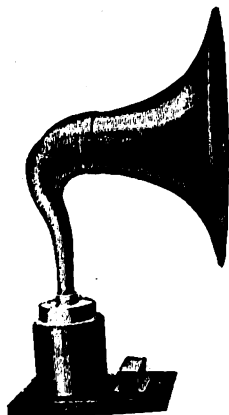
Our supply of back numbers of **RADIO WORLD** (Nos. 1 to 7) is limited. We will take orders for the first seven issues until the supply is exhausted. If you want these numbers, or want your subscription to start with any special number, let us know.

Radio World Co., 1493 Broadway, New York City. (Adv.)

What a Brother Says

RADIO WORLD, a weekly paper devoted exclusively to the newly popularized wireless art, continues to gain in favor. Aside from its helpful articles on the construction and operation of receiving sets, **RADIO WORLD** is attractively illustrated with half-tone newsy photographs of a national range of interest.—Newark, N. J., "Call."

Loud Speakers \$45



DIALS

VARIOMETERS

VARIOCOUPERS

TELEPHONE HEAD-SETS

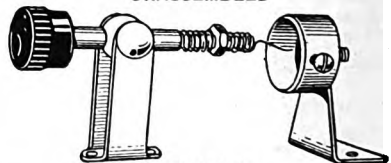
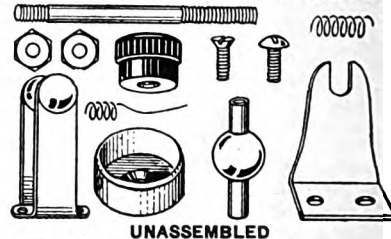
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Radio Patents

RECENTLY ISSUED

RADIO WORLD is making a special effort to give its readers regular weekly service regarding the news of radio patents, granted or pending, at the United States Patent Office, Washington, D. C. The first installment of this important service appears herewith, and will be continued from week to week as the material is issued by the Patent Office.

A patent simply because it is a

patent, must be a very valuable thing. It is interesting to know that 75 per cent. of the patent claims allowed by the United States patent-office cover worthless devices. The patent office has no control over this matter.

If you have money to invest in radio proceed cautiously. If you are not sure, ask a friend who knows something about radio to help you reach a decision.

Fig 1

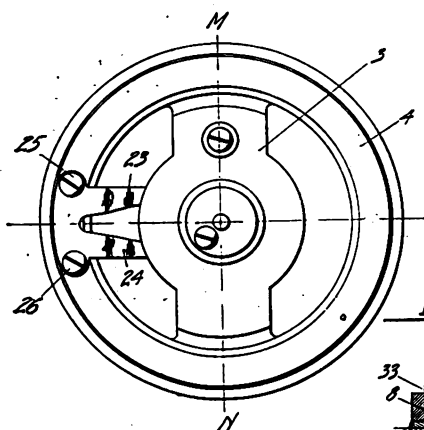
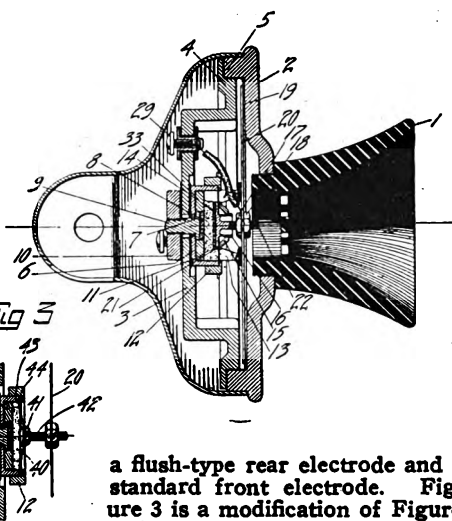


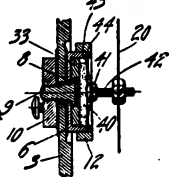
Figure 1 is a back view of a complete transmitter. Figure 2 is a cross section on the line M-N of Figure 1, showing a microphone construction, involving

Fig 2



a flush-type rear electrode and a standard front electrode. Figure 3 is a modification of Figure 2, in which both rear and front electrodes are of the flush type.

Fig 3



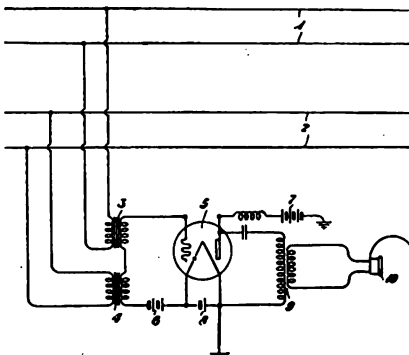
ALEXANDER E. KEITH, Hinsdale, Ill., has invented an improvement in telephone transmitters which has for its object to provide a microphone structure in which the detrimental effects due to an inactive mass of granulated carbon or other comminuted material is eliminated; and in which the possibility of the occurrence commonly known as, "packing," is reduced to a minimum.

KARL S. VAN DYKE, Chicago, records an invention relating to signaling circuits, and more particularly to arrangements for maintaining synchronism between alternating currents separately generated at different stations of a signaling system.

One of the features of the invention is the provision of means whereby alternating currents supplied from two indepen-

dent sources may be automatically maintained at the same frequency.

Another feature of the invention is the provision whereby alternating currents supplied at the receiving station of a signaling system may be maintained in synchronism with carrier currents received from a distant sending station.



The advantages of the arrangements of this invention are, in general, that one amplifier and listening set can be used simultaneously on as many different circuits as desired.

GEORGE CRISSON, Hackensack, New Jersey, a service-observing set which relates to communication systems and more particularly to arrangements for observing

the service on such systems. It is the purpose of the invention to provide a service observer's set, or listening-in apparatus, which is adapted to be used simultaneously with a plurality of circuits and which may be associated with such circuits in a manner so that there will be no interference, such as cross-talk, between circuits.

CARL F. HIGH, Madison, Wisconsin, has invented improvements for storage-battery cells.

His invention relates to cells for storage batteries, and its objects are to construct

Fig. 1.

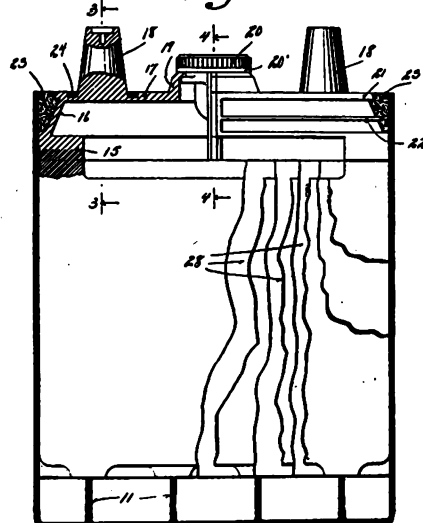
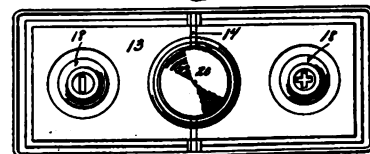


Figure.



a cell which will be more durable than those now known and in which the plates will be securely held in their proper position, and in which provisions are made to counteract the effects of acid creepage.

Fig. 3.

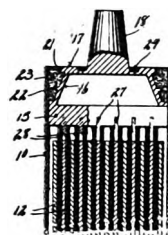


Fig. 4.

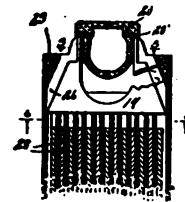


Fig. 6.

Fig. 5.

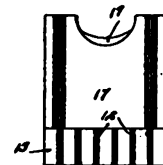
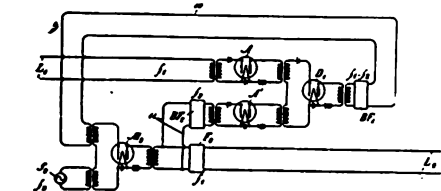


Figure 1 is a vertical section. Figure 2 is a plan view. Figure 3 is a section taken substantially on the line 3-3 of Figure 1, with a part broken to show the grouping strap. Figure 4 is a section taken on the line 4-4 of Figure 1. Figure 5 is a section on the line 5-5. Figure 6 is a section on the line 6-6.



Mr. Van Dyke's invention designates a circuit whereby a frequency generated at a distant point may be applied to the apparatus shown at the station of the figure.

RADIO WORLD

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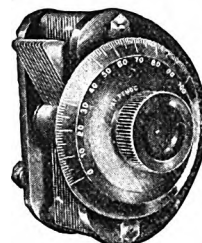
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 dollars yearly. The powerful trans-oce-
 anic radio stations would be quite unneces-
 sary if static did not exist. Since it does
 exist, reliable communication is possible
 only when great power is used. Hence the
 large stations, which cost hundreds of
 thousands to build, to say nothing of the
 expense of upkeep. And we have nothing
 but static to blame. If some one invented
 a cheap, positive static eliminator it would
 be worth at least one million dollars in
 cold cash. It would be possible to use one
 quarter of the power that is now used to
 "push" our messages through to the other
 side. This would also mean that radio
 messages could be sent for one-quarter of
 the present rate. Every message sent to-
 day helps pay for the upkeep of an enorm-
 ous station. A static eliminator would put
 radio development ahead fifty years. Not
 only that, but it would scrap the cables of
 the world in five years' time. The cable
 companies would no longer be able to main-
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 equals122 "
 This leaves243 "
 If you rest eight hours a day.....122 "
 This leaves121 "
 There are 52 Sundays 52 "
 This leaves 69 "
 If you have half-day Saturday .. 26 "
 This leaves 43 "
 If you have 1½ hours for lunch.. 28 "
 This leaves 15 "
 Two weeks' vacation 14 "
 This leaves 1 day
 And on Labor Day nobody works 1 "

Twenty Years from Now

Twenty years from now, when pocket
 wireless-outfits will be as common as
 watches are now, we will be boasting that
 we saw the pioneer's devices. Times will
 be so changed, with so many now un-
 thought-of marvels, that the people of 1942
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 when an old soldier reminiscences.—
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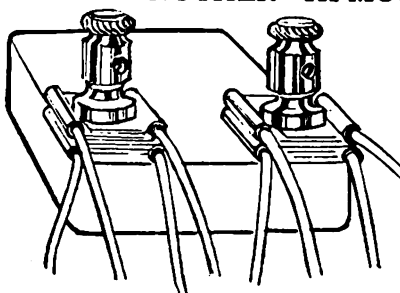
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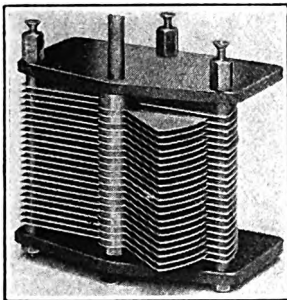




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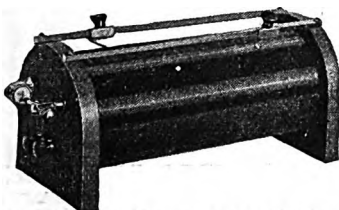
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The "Lone Amateur"

Editor, RADIO WORLD: In the article in RADIO WORLD No. 4, dated April 22, entitled "Why Is One Wire Considered Sufficient for a Receiving Station," Edward Linwood says that most amateurs are concerned primarily in broadcasts, which are sent, with a few exceptions.

I think it is high time that a definite distinction be made between the "novice,"—who has appeared in great numbers, due to broadcasting—and "amateurs."

Broadcasting is accepted by amateurs as another step in development. But they are far from primarily concerned. We, who have been in the game for some time, know, from our own experience, that the "true amateur" is working for development of sets to be able to cover distances, as shown by the recent trans-Atlantic transmission by amateurs. We want to "reach out" and talk to our neighbors in Texas, Colorado, California, etc. We do not gauge the efficiency of our receiving set by how loud we get these broadcasts, but by the distance we cover, and some remarkable distances have been covered by this group of amateurs throughout the entire world.

I feel confident that I am expressing the opinion of all the amateurs in this matter. But will more of the old timers express themselves on this subject?—E. C. Runquist, A. M. I. R. E., New York City.

Finds Aerials Unnecessary

Editor, RADIO WORLD: While fooling with the wires and connections on my two-slide crystal receiver-set, I discovered that by connecting by ground to my gas stove, and the binding post for my aerial wire to the coldwater pipe with a short wire, I had a perfect circuit on which I heard WJZ's concert more distinctly, if anything, than when I used my ordinary aerial on the roof. I now have dismantled my aerial and am using this new circuit exclusively with splendid results. In the daytime, when the signals once were weak they now are as strong as during the evenings. It seems that aerials are quite unnecessary.—F. C. Herskind, New York City.

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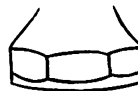
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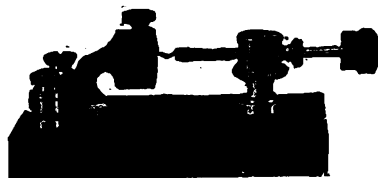
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The rate for this RADIO WORLD QUICK ACTION CLASSIFIED AD. DEPT. is 5c. per word (minimum of 10 words, including address), 10% discount for 4 consecutive insertions, 15% for 13 consecutive insertions (3 months). Changes will be made in standing classified ads., if copy is received at this office before 4 P. M. on any second Tuesday preceding date of publication. RADIO WORLD CO., 1493 Broadway, New York City. (Phone, Bryant 4796.)

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Wanted.—A few Western Electric VT-1's, VT-2's and head sets for use in our laboratory. Must be perfect. State quantity and lowest price. Reading Radio Shop, Box 6, Reading, Mass.

Wanted.—Men—Boys over 17. Become Railway Mail Clerks. Commence \$133 month. Common education sufficient. List positions free. Write immediately. Franklin Institute, Dept. E 152, Rochester, N. Y.

Wanted for spot cash. High grade Radio outfits, parts, attachments and materials of standard makes. No home made apparatus will interest us. Address F. J. Lamb, 1988 Franklin St., Detroit, Mich.

AMERICAN MADE TOYS
Manufacturers wanted for large production and home-workers on smaller scale for Metal Toys and Novelties, Toy Soldiers, Cannons, Cowboys, Indians, Buffalo Bills, Wild Animals, Whistles, Bird Whistles, Race-horses, Prize-fighters. Wag-tail Pups, Barking-dogs, and hundreds of other articles. Hundreds and thousands made complete per hour. No experience or other tools needed. Bronze casting forms complete outfit from \$5.00 up. We buy these goods all year, paying fixed prices. Contract orders placed with manufacturers. Exceptionally high prices paid for painted goods. An enormous business for this year offers industrious men an excellent opportunity to enter this field. Write us only if you mean real business. Catalog and information free. Metal Cast Products Co., 1696 Boston Road, New York.

Free.—Complete antenna outfit with each \$25.00 De Forest Everyman receiving set. Call Room 27, 1666 Broadway, New York City.

100 ft. 7 strand Copper Aerial Wire \$.71
100 ft. Hard Drawn Copper Aerial Wire49
Aerial Insulators23
Nickel Plated Binding Posts94
22½ Volt small "B" Battery90
22½ Volt large "B" Battery 1.40
22½ Volt large variable "B" Battery 1.90
45 Volt double size Variable "B" Battery 2.80
Nickel Plated Constant Points doz. .20
Nickel Plated Switch Arms57
Branch Lightning Protectors 2.37
Porcelain Vacuum Tube Sockets56
½ inch Slider and 10 inch Rod45
Coils wound on Tube75
Crystal Detectors, (N. Y.) 1.20
Mounted Tested Galena25

LIBERTY RADIO CO.
Church and Liberty Streets, New York City, N. Y.
Phone Rector 3432

Crystal Set That Gets Radio Concerts. Build it right boys. Plans and full instructions for building at low cost, high grade fine adjustable Crystal Receiving Set, fifty cents postpaid. Dept. R. D. Shaw Mfg. Co., Galesburg, Kans.

Build Your Own Radiophone.—Send ten cents for instruction book. Radio Service Institute, U. S. Bank Building, Washington, D. C.

"Radio inventions of merit developed or financed."
H. William Baer, 162 Wood St., Waterbury, Conn.

We buy your Radio goods. Head sets wanted. Radio Shop, 1246 Gates Ave., Brooklyn, N. Y.

Bargains.—Camara, \$8; Chuch, \$4; \$50 Cornet; \$28 Mele; \$9 Foxom. East Haven, Conn.

High Grade Antenna Wire. Best quality 7 strand No. 22, tinned copper, non-corrosive antenna wire. Only 1c. per foot. The Kehler Radio Laboratories, Dept. W., Abilene, Kans.

We buy second hand radio goods, any description. Columbus Shop, 874 Columbus Ave. (108d). Open evenings to 10 o'clock.

The Standard Radio Log and Record.—A Continuous Diary and Record of all station activities. Provision for recording Calls Received and Sent with location, distance, wave length and other information. Sections for keeping records of Calls Frequently Used, Station Data, License Numbers, Equipment Inventory, Notable Performances, etc. Flexible binding, 48 pages and cover. Price 30c., prepaid or from your dealer. ecalfe Publishing Company, 56 Harrison Ave., Springfield, Mass.

THIS MONTH'S SPECIAL
Complete aerial outfit—100 feet hard drawn copper wire—50 feet rubber covered wire—four 4" antenna insulators—1 lightning switch—1 porcelain tube—1 ground clamp—\$2.50, complete, postpaid—Remit postal or express money order to M. J. Winkler, 220 West 42nd St., New York.

Wireless phone "B" Battery—direct from manufacturer. Large \$2.00, small, \$1.00. Postpaid, 22½ volts. Wireless phone "B" Battery Co., 321 Canal St., New York.

Radioists, Attention!—Immediate delivery (by return mail) guaranteed on all our apparatus. UV-201 Radiotrons, Detector or Amplifier, \$6.50. Olapp-Eastham HR Regenerative and Amplifier sets in stock, \$39.00. Galena per crystal, \$0.10. Write for our price lists. Wireless Experimental Testing Station, c/o Workers Outfitting Store, Johnson City, N. Y.

Antenna Wire. No. 14 Copper 45c. (per 100 Ft.); 7 strands No. 22—90c. (per 100 Ft.); Weight 2 lbs. Immediate deliveries. Chas. L. Manning, 1558 Miller St., Utica, N. Y.

Complete Blue Print Instructions on home made Radio sets. Easy to read. Both Crystal and Tube. Send 50c. Eastern Radio Exchange, Southboro, Mass.

Write your messages on an Eterna Writing tablet. No pen or pencil needed. Everlasting. 35 cents, prepaid. Walker, 54 North Ninth St., Newark, N. J.

GREBE SETS

Including their Latest Creation

C—R—10

MURDOCK MOULDED

Phones and Condensers
Variometers
Variocouplers
Panels drilled for above—no extra charge
Mail orders shipped in 24 hours

**Brooklyn Wireless
Installation & Supply Co.**
876-A Flatbush Ave., Brooklyn, N. Y.
Tel. Flatbush 2012

You will find many Special Values in our display advertisement in Radio World issue May 13 and May 27.

BEACON RADIO and ELEC. CO.
246 Greenwich St., N. Y. C.

First Big Radio Dinner of Society of Arts and Sciences

A BIG RADIO DINNER took place at the Hotel Pennsylvania, Sunday evening, April 30. It was given under the auspices of the Society of Arts and Sciences—an institution that has fostered many successful dinners for the advancement of civilization, at which many men and women in public life have given free rein to their views. The radio dinner was largely attended. The principal speaker was Hudson Maxim, the inventor. Other speakers were David Saranoff, general manager, Radio Corporation of America; William Wade Hinshaw, president, Society of American Singers; Jack Binns, hero of the steamship "Republic."

IMMEDIATE DELIVERY

Estru-Variometers and
Vario-Couplers

Lattice type, Sharp tuning,
Maximum efficiency

Variometer \$5.00
Vario-Coupler 4.50

Head Phones:

Frost, 3000 Ohm \$6.00
Frost, 2000 Ohm 5.00

Mail orders promptly filled
Dealers write for our proposition
Complete Radio Equipment

NORTHERN RADIO SUPPLY CORPORATION

542 WEST WASHINGTON STREET
MAIN 2230-2276 CHICAGO, ILL.

DEALERS

On Hand For—IMMEDIATE DELIVERY

Contact Points
Switch Stops
Aerial Wire
Magnet Wire
Spaghetti
Porcelain Tubes
Ground Clamps
Binding Posts
Slider Rods
Sliders
Copper Lugs
Phone Condensers
Novo B Batteries
Contact Switches
Tubes and End Blocks
Midget Comp. Insulators
Porcelain Insulators
Lightning Arrestors
Fahnestock Connectors
Mounted Crystals
Radion Dials
Radion Panels
Variable Condensers
Vacuum Tube Sockets

Out of town orders given prompt attention

RADIO ACCESSORIES CO.
220 WEST 42nd STREET NEW YORK, N. Y.

BOYS DO NOT FAIL

To obtain your copy of these instructions. Worth many times the small amount we ask. How to construct a variometer, how to construct a variocoupler and an amplifying transformer. Detailed instructions of either for fifteen cents or put four dimes in an envelope and get the three with diagrams of connections for your set. Save money by constructing your own. We have left no details to guess about. We enclose list of all parts how much of each to get and where to obtain same.

**Newco Radio & Electrical
Supply Co.**
Stratford, Conn.

Broadcast Bill's Radiolays

(Copyright, 1922, Westinghouse Electric & Manufacturing Co.)

I'VE never heard an angel sing, don't spose I ever will, but I've been hearin' just as good as sure as my name's Bill. I heard a song the other night that made my heart rejoice, I wondered if the singer was as pretty as her voice; she sang a song as soft and sweet it sounded like a bird awarblin' at the break of day the kind I've often heard down yonder in the pasture lot all wet with mornin' dew er sailin' way up in the sky a speck agin the blue. Now folks that there is music when it makes you think of spring an' meadow larks an' violets an' all that sort a thing, the more I hear, the more I like that hifalutin sing-in', an' all day long them purty tunes is in my head a ringin'. My wife, she can't get over how it's changed my disposition: I



tell her it's a new disease called "Radio Condition;" I just can't keep from whistlin' and a singin' all day through. Yep! I guess I've changed a lot, I uster be so blue, a worryin' about the farm an' them two kids o' mine; but all the crops have turned out well, the boys are doin' fine. An' here I sit each evenin' with them things tight on my head, an' I just keep on listnin' till its time to go to bed. The fellows loafin' at the store can't seem to figger out why I stay round the house so much, er what it's all about; o' course you get a lot of news down at Si Perkins' store, but since I got my wireless set I hear a whole lot more, an' best of all, I like them songs sung by some purty gal, her songs are sweet, I'll bet she's neat. Doggone! You know me, Al.

Back Numbers of Radio World

If you were not able to get the first seven issues of RADIO WORLD, your news-dealer can probably get the copies through his wholesaler, or copies will be mailed from this office direct, at 15 cents per copy. RADIO WORLD CO., 1493 Broadway, New York, N. Y. (Adv.)

Preserve our Broadcasting Map. See pages 16 and 17 this issue.

"WISDOM."

Everything in Radio Is Available Here—We Are Manufacturers and Distributors of High Grade Parts and Complete Equipment.

"It is good business wisdom to place your full requirements with us"

Prompt Shipments Await Your Orders On:

"Nerco" 2200 Ohm Phones
Crystal Detectors
Variable Condensers
(23 and 43 Plates)
Fixed Condensers
Dials and Knobs
Variocouplers
Variometers
Rheostats

Binding Posts
Stops
Galena Cups
Arm Contact Switches
Switch contact points
Insulators
Magnet wire
Tuning coils—with two sliders
V. T. Sockets

"NERCO" PHONES ON HAND AT ALL TIMES

De Forest Sets Complete Including the M R 6's.
Federal Sets Complete With Phones.

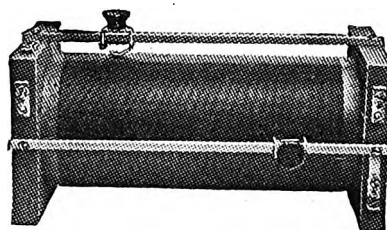
ASK US about our little set complete with "Nerco" phones

Listed at **\$11.50** It's a Marvel

Dealers and Jobbers Write for Proposition

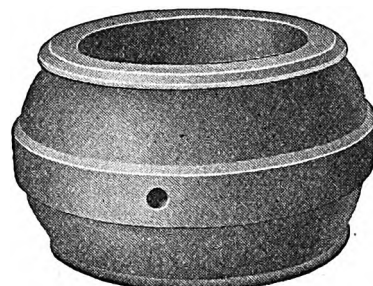
Wiener Wireless Specialty Co.

Telephone—Market 5668
21 ACADEMY STREET
NEWARK, NEW JERSEY



"Essex" Tuning Coils—Double Slide—
Enameled wire—Good for loading coils.

LIST PRICE, \$3.00



"Essex" Polished Wood 3-inch Rotum
LIST PRICE, 50c

ATTRACTIVE DISCOUNTS TO DEALERS

3/16" Sliders, 3/16" Slide Rods, Mounted Crystals, .001 Fixed
Condensers, Crystal Detectors, Lightning Arresters

ESSEX MANUFACTURING COMPANY

NEWARK

117 Mulberry Street

NEW JERSEY

KEYSTONE VARIABLE CONDENSERS

21 Plate
\$3.80

43 Plate
\$4.75

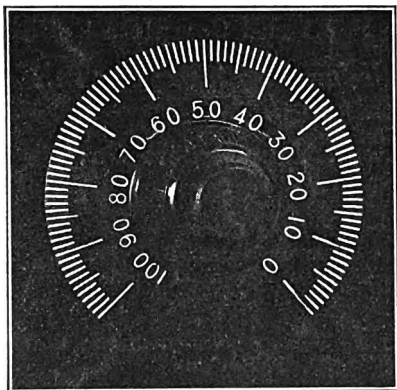
Our selection of materials and built-up type design give assurance of low energy loss and high efficiency.

Agents and Jobbers write for information.

KEYSTONE MOTOR COMPANY

OAKS, MONTG. CO., PA.

Vernier Rheostat



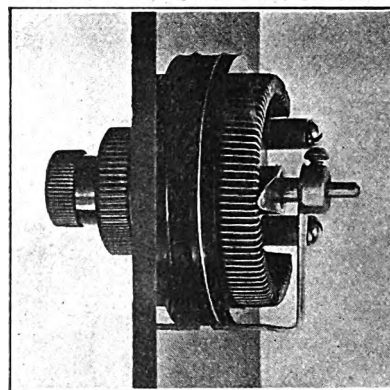
Panel Mt. with Dial
PRICE \$2.50

The Smallest!
REGULAR RHEOSTAT WITHOUT
DIALS \$1.10

**TECO.
RADIO CO.**

P. O. BOX 3362
BOSTON, MASS.

Vernier Rheostat



Panel Mt. without Dial
PRICE \$1.65

The Neatest! ***The Best!***
REGULAR RHEOSTAT WITH
DIALS \$2.00

Distributors

Wetmore-Savage Co.

76-78 Pearl Street,

Boston, Mass.

Can you maintain that critical adjustment on your V. T.?

TeCo's New Vernier Rheostat makes it possible for you to obtain and hold that necessary fine adjustment of filament current to render your receiving circuits in their most sensitive condition.

SPECIFICATIONS

DIAMETER OF RHEOSTAT 2".
RESISTANCE 6 OHMS.
BASES MADE OF REAL BAKELITE
SPECIAL ALLOY WIRE TO REDUCE LOSS IN HEAT.

With our Vernier Rheostat it is possible to obtain variations of one-one thousandth (1/1000) of an ampere.

Our attachment does not interfere with any previous method of panel or table mounting.

A recent development in the design of rheostats for use with receiving tubes. This instrument consists of a conventional form of rheostat, with the addition of a finely adjustable Vernier attachment. The latter consists of one turn of resistance wire wound about the bakelite form and continuously variable by means of an extra contact. This contact is operated by means of a small knob, the shaft of which passes through the hollow shaft of the larger control knob, which regulates the resistance by turns. The elements of the rheostat are so built that, with one ampere flowing in the circuit, one complete turn of the Vernier control only changes that current one-tenth of an ampere. With such a small change, it is easy to obtain a variation of as small as one milli-ampere.

The **VERNIER RHEOSTAT** eliminates the necessity of a B-battery potentiometer and the extra space it requires. After all, it is not a fine control of either plate or filament sources that we require for our detectors, but a finely adjustable balance of the two, which will allow us to operate on the best point of the filament-current, plate-voltage characteristic to obtain maximum efficiency in detection. This consideration is quite necessary in using the later types of vacuum tubes which are very critical in operation.

Every Seven Days

ISSUE OF MAY 27, 1922

15c A COPY

1 year (52 numbers), \$6.00; 6 months, \$3.00; 3 months, \$1.50

RADIO WORLD

Entered as second-class matter, March 28, 1922, at the post office at New York, New York, under the act of March 3, 1879

I L L U S T R A T E D

“Stop! or we fire!” Orders by Radio

Before New York and New Jersey police officials and United States Army officers a new-type machine gun and radio-equipped motor-car was demonstrated at Tenafly, New Jersey. This gun fires a thousand shots a minute. It is suggested that metropolitan police departments with a motor-cycle corps so armed could make short work of mob violence. The loop aerial is in the rear of the car and the receiving set inside.



(c. International)

Why the Condenser Doesn't Condense, By E. L. BRAGDON

TUNING AS APPLIED TO TELEGRAPHY, By WALTER J. HOWELL, A. M., I. R. E.

THE RADIO READING COURSE

Teaching the Simple Theory, Design, Construction, Operation
and Maintenance of Radio Reception Apparatus

A complete, up-to-date, low-priced Course to meet your problems

GET A THOROUGH GRASP OF RADIO WITHOUT
TEDIOUS STUDY

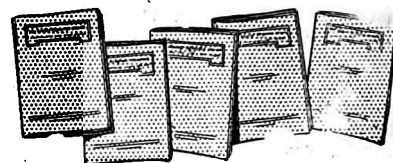
If you want to get real RESULTS from radio apparatus your first expenditure should be for The Radio Reading Course. Then with the knowledge of radio that you have acquired you will know how to buy, operate, maintain, repair, design and build apparatus and get the utmost pleasure and profit from radio. Instead of spending \$50. or \$100. on mistakes, start right and acquire the accurate, up-to-date technical knowledge given in the Course. Without long tedious study in five complete Lecture Books, a foremost radio engineer, inventor and "father" of radio telephony takes you quickly and smoothly over the whole subject giving you the essential, practical, working knowledge you need to get "expert" results.

With a grasp of the whole science, new fields of effort and pleasure will be

opened to you—you will shed your role of beginner and go at radio like an expert.

The Lowest-Priced and Most Accurate Course

Not a re-written left-over from radio of years ago but — new, up-to-date absolutely accurate and comprehensive. The lowest-priced Course you can get and the most authoritative. Very moderately priced at \$10 as against other Courses at \$100. The savings through your superior understanding of radio will alone return the price of the Course many times over. You need The Radio Reading Course as instructor, guide and for reference, so take advantage of the special plan explained in the next column.



The complete Course yours under a special plan

You can start getting the benefits of the Course at once by sending the order form below and only \$3.50. Then upon receipt of the first Book, send the balance (\$6.50) for the complete Course. To get all the benefits of a thorough grounding in radio—to save money through knowledge—to add to your pleasure—send your order now.

RADIO COURSES, Inc., Dept. A8.
15 East 40th Street, New York City.

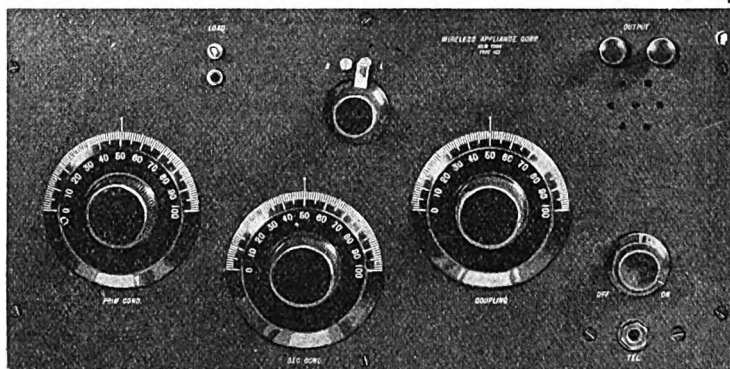
Gentlemen: herewith \$3.50 money order (or check) for which send at once the first Lecture Book of The Radio Reading Course. Upon receipt I will then send balance (\$6.50) for the complete course of Five Lecture Books.

NAME

STREET

CITY & STATE

\$100 FOR A NEW NAME



Made of solid mahogany with hand rubbed finish, with panel of best grade bakelite, satin finished and beautifully engraved. All connections are made thru the rear of cabinet to nickel-plated binding posts, thus concealing unsightly wiring and facilitating necessary connections.

Ask your dealer to show you the PAN-AUDIO today, or send us his name if he has none in stock, and we will explain how you can earn \$100 by suggesting a new name to take the place of Pan-Audio. Or write us for descriptive matter and full details.

SEE OUR BOOTH AT THE RADIO SHOW, 71st REG. ARMORY, MAY 22—27

For perfect results in receiving nothing can beat the PAN-AUDIO Type 102. Here is a real Vacuum Tube Receiving Set for the Radio Enthusiast who knows what he wants at the right price. The PAN-AUDIO combines power, appearance, durability, efficiency, freedom from vibration and distracting noises, and insures maximum results and satisfaction.

PAN-AUDIO

"Let The World Talk To You"

Permits a wave length range of from 175 to 5,000 meters and The PAN-AUDIO enables you to receive from the broadcasting stations at Newark, Schenectady, Pittsburgh, and others whose wave lengths are below 500 meters.

The Wireless Appliance Corp., 513D 6th Ave., New York

GOOD NEWS!

THE GRIN

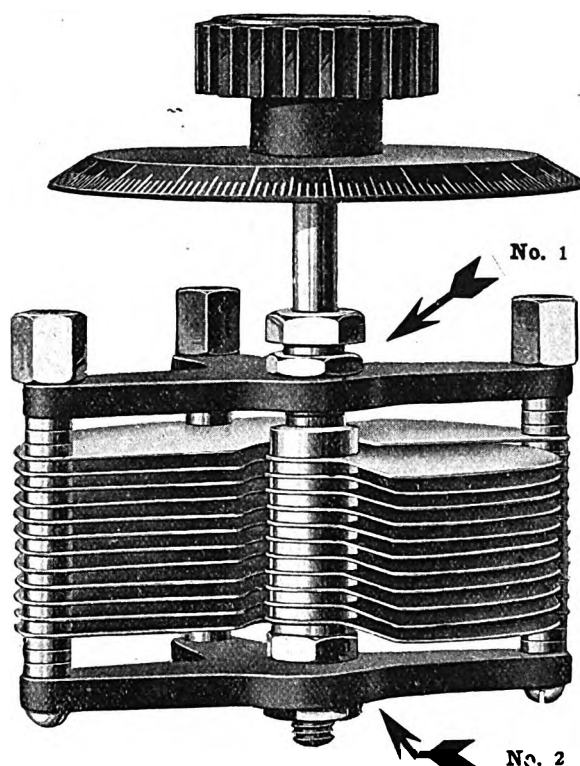
ENDORSEMENT

It is positively and emphatically endorsed by advanced Radiomen who have given it most rigid tests and agree it is a highly successful condenser.

The upper bushing No. 1 and lower pivot No. 2 allow a simple adjustment of movable plates so that they are equally centered with stationary plates thereby preventing shorting and allowing sharp tuning.

.001 M. F.
43 Plate

With moulded dial,
\$4.75



FEATURES

No end play. Any wear on lower pivot can be taken up by upper bushing adjustment, making this a long life condenser which gives extremely sharp tuning. Top and bottom are genuine Bakelite. Shaft and all other parts are made of brass and are all nickel plated. May be mounted in vertical or horizontal position. Can be used for receiving, and for transmitting up to 500 volts.

.0005 M. F.
23 Plate

With moulded dial,
\$4.25

VARIABLE CONDENSER

VIZZO PRODUCTS CO.

THOMAS B. PELLEGRIN, General Manager

Manufacturers of Grin Variable Condensers and other Radio Equipment

OFFICES and SALES DEPARTMENT

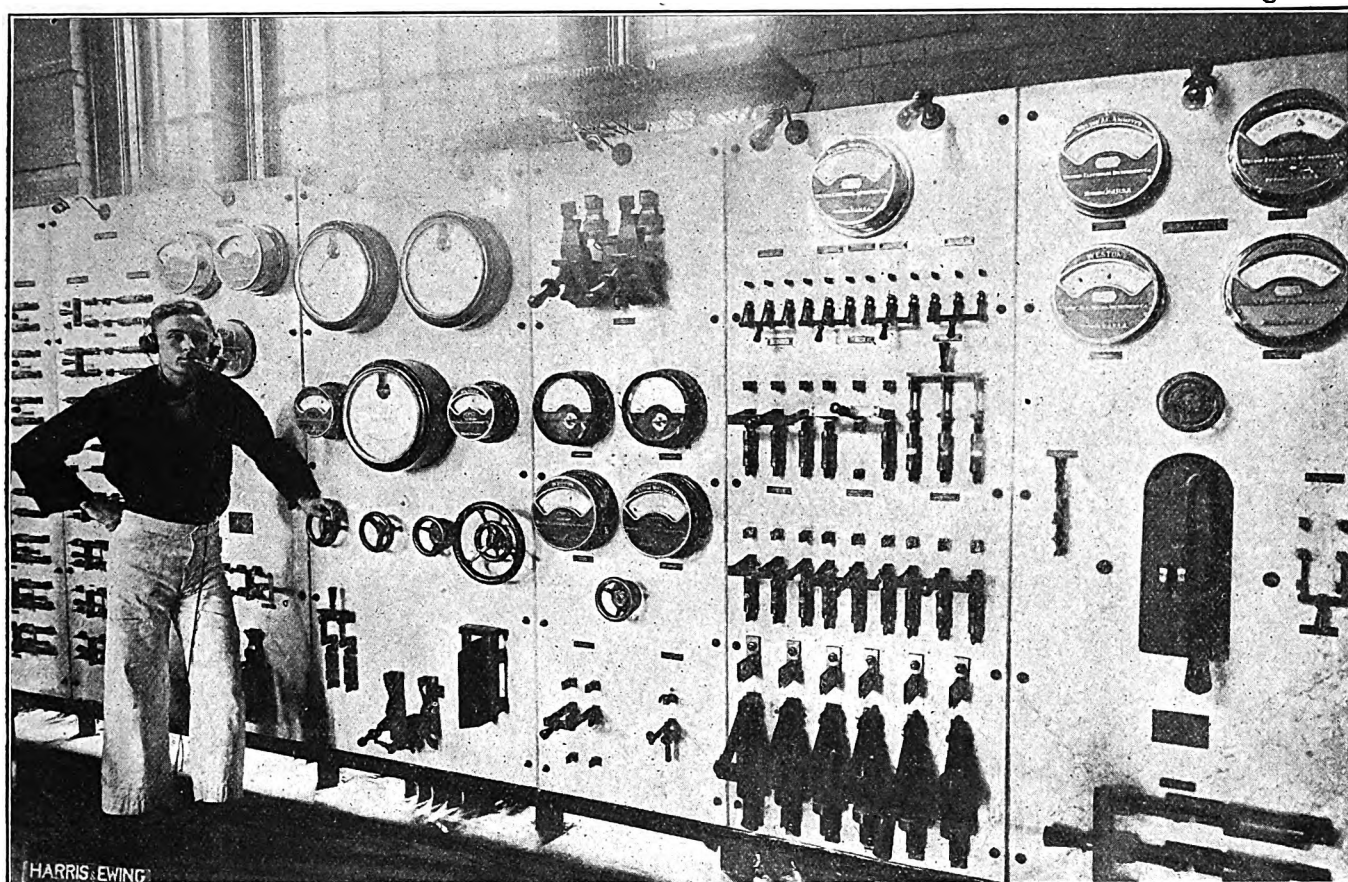
1263 BEDFORD AVE., BROOKLYN, N. Y.

Factory: Shelton, Conn.

Go to Your Local Dealer. If He Cannot Supply You, Our Mail Order Dept. Will.

Jobbers and Manufacturers, Write for Our Proposition.

Main Switchboard at Arlington, Va.



(c. Harris & Ewing, Washington, From Paul Thompson, N. Y.)

In *Radio World* No. 7, dated May 13, Fred. Chas. Ehlert described the great Naval Radio station at Arlington, Virginia. In this current number is published a photograph of the main switchboard of the radio shack from which all available power may be had. It may look complicated, but after a student has spent a number of years in the Naval school and served as an apprentice, this important position is of vital interest. Only trained and experienced men can handle this equipment. The switchboard is so arranged that no matter what the source of any trouble may be, the operator on watch must make some temporary connections so communication may be kept going. Some night while listening to NAA, something might go wrong, but the quick combinations can be corrected instantaneously. Every maritime man and jeweler can depend upon the Arlington time tick sent out each day.

WE cherish the distinction of chatting with you fans who read "the only radio weekly." There is much we want to gossip about with you, but we will have to watch our space pretty carefully. Anyhow, guess you've all read of that new stunt the Squire down in Washington pulled off, "wired wireless?" Seems like somebody is always getting rough with the ether. The poor waves are to be forced to walk the chalk line; follow right along a wire, even through a river! Won't they get damped?

* * *

It won't be long before you can tune in the apartment next to yours and listen to the old man pulling his dull razor over a stubby beard—and what he thinks of the procedure. Take your 2,000 ohms, add a few flourishes with the dials, and listen to the family enjoy their soup. So many things a sending set can pass on to the world at large. We read, suppose you

Hook-ups

By A. P. Taylor

all did, too, of the broadcasting station that turns on a red light in the artists' room when they do their bit. Its to let them know that every sound produced will be the property of the waiting public. So we can't look for much extra stuff there, unless someone new at the game gets elated with the idea of addressing a million or so of folks and treads on air. If that happens, then you'll hear a lot of static.

* * *

We have a sympathetic galena that quivered all over when a correspondent recently objected to so much broadcasting. "More about telegraphy," this friend wants. Now we can't be too selective—we're not the editor; but it do seem as if a little

more code stuff would make a happy family of the radio worldists. Ralph R. doesn't seem to see "these new hams" as capable in the matter of amplifying radio. Hold on! Copying an "8 or 9!" Why not lead 'em up gradually? It sure takes time to get in the amateur class, ye know. There's Mr. Hoover. He lives in the same town with the Squire. He's trying to get in with the bunch of fans who sit on their keys, watching the professionals go by. Had a big party down there, only we didn't get to go. Understand it was a success though.

* * *

Old-timers, step up and join the lodge. The Radio Pioneer's Society should bring out a goodly crowd. We suggest a coherer set as the emblem, to be worn on Sundays and holidays. After the society gets going strong, the next thing, naturally, would be a big feed for all the old-timers (including your humble scribe). Who will start the ball a-rollin'?

Radiograms

VACUUM TUBES were being manufactured at the rate of 5,000 a month last fall. In January, the output was increased to 40,000 a month. In April, it is announced, the production will reach 150,000; in May, 175,000; in June, 200,000—an increase of almost 45 per cent.

RADIOTELEPHONY has practically eliminated the carrier pigeon as a message bearer. Recently the United States Army decided to sell its surplus birds, but not a single bid was received.

A RADIO COURSE by mail is the possible addition to the Knights of Columbus National Correspondence School at New Haven, Conn.

THE BOX-OFFICE OF THE GLOBE THEATRE, New York, is now equipped with a radio-receiving set to take care of reservations from passengers on incoming steamers.

INSTRUCTIONS FOR THE BLIND is certain to be increased by radio. Frequently, it is reported, some blind person is able to appreciate many of the programs enjoyed by a normal person. The educational limits of radio are without limit.

\$50,000 HAS BEEN ASKED by the New York City Board of Estimate for a municipal radio-broadcasting station. The special committee on radio appointed by Mayor Hylan, has made the request.

TWO BUSINESS MEETINGS WERE CALLED TO ORDER BY RADIO for the first time in history on April 26. Walter Neumuller, secretary of the New York Edison Co., at the broadcasting station of the Western Electric Company, New York City, at noon, opened the meetings of the New York Electrical League at the Hotel Astor and the New York Electrical Society at the New Hell Gate Station of the United Electric and Power Co.

THE PENNSYLVANIA STATE POLICE have put in operation a radio system by which daily bulletins of crime will be flashed to thirty-five municipalities that have established receiving stations.

MONEY WILL BE RECEIVED AT SEA BY RADIO when the Farmers' Loan and Trust Company completes arrangements with the London Joint City and Midland Bank, Ltd. Wireless payments will be made at any time en route to passengers aboard the Cunard liners "Mauretania," "Aquitania" and "Berengaria."

COMMUNICATION WITH DEPARTED SPIRITS BY RADIO is announced by Hereward Carrington, of the Society of Psychical Research, New York. A large laboratory is being equipped with special apparatus designed by Thomas A. Edison. No information has been given as to how the spirits will be informed of the correct wave length to tune in on for these earthly messages.

THE POSITION OF SHIPS AT SEA will be broadcasted daily at 8 P. M., by the Radio Corporation of America through WJZ, Newark, N. J. The noon-day positions of vessels at sea, as reported to the corporation's several stations along the Atlantic Coast will be forwarded to the Marine Radio Bureau, No. 64 Broad Street, New York.

RADIO FANS ARE WARNED by the Bureau of Standards, Washington, D. C., to pay strict heed to fire-insurance rules in hooking-up radio equipment in their homes. Violation of the rules will result in great increases in insurance rates or, possibly, cancellation of policies. The bureau also furnishes notice that fire-insurance regulations governing the installation of apparatus are to be revised.

THE "INSTRUCTORLESS" CLASSROOM is announced from Chicago. Peter A. Mortenson, superintendent of schools, makes the announcement that instructors will lecture into transmitting stations at central points, making it possible for one instructor to serve a number of classes.

Carries Radio Set on Tour



Jeanne Eagels, the actress, is a confirmed radio fan and has reached the stage where she carries a special portable set when on tour with her company. Miss Eagels's set contains an especially sensitive circuit arranged with fifteen taps and a variometer for the purpose of tuning in on the various wave lengths used in different broadcasting stations throughout the country. A special portable case is so arranged that the cover can be removed when in use. Two binding posts are provided for antennas so that either a long or a short antenna may be used. The interior construction is of particularly rugged design to prevent injuring in traveling, and all interior connections are soldered.

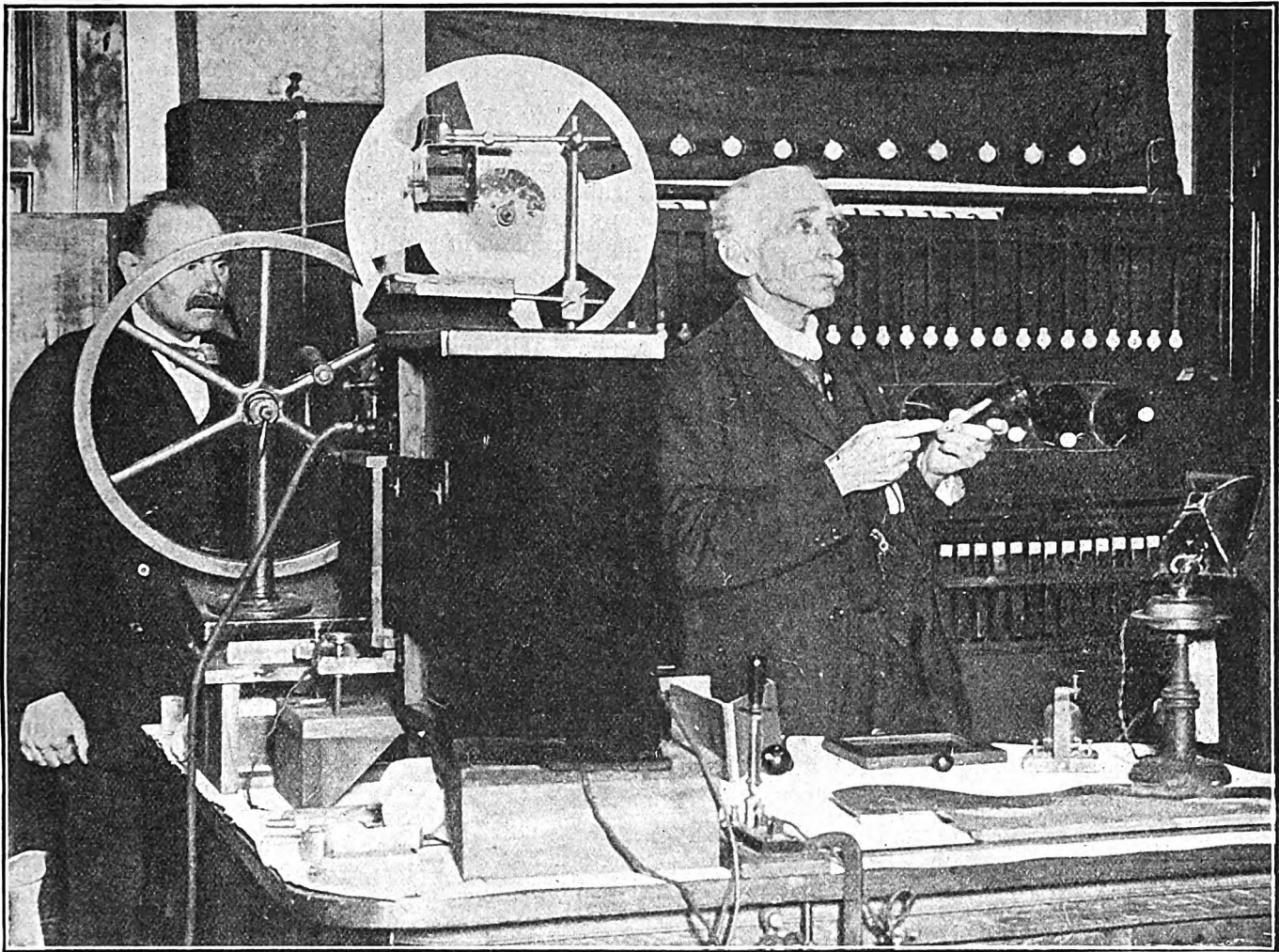
GREAT BRITAIN CLAIMS ONLY 2,000 RADIO FANS against over a million in the United States. But, according to Godfrey Isaacs, managing director of Marconi's Wireless Telegraph Company, London, the British are about to start showing Americans how the game should be played. The time will come when there will be a receiving set in every British home, he says.

THE BRITISH NAVAL RADIO STATION at Bunberg, Donegal, Ireland, has been destroyed by fire. This was the station from which mutineers of the Irish Republican Army recently evicted the British post guards, the mutineers, since that time, holding possession.

FIRST BIG FIGHT NEWS BY RADIO! This history will record in connection with the Carpenter-Lewis battle in London, on May 11. The cables state that the disappointing bout was broadcasted from London newspaper offices.

APARTMENTS VALUED AT \$1,000,000, EQUIPPED WITH RADIO, will be erected in Philadelphia.

One of Britain's Leading Radioists



(c. Kadel & Herbert News Service).

This photograph pictures (at right) Professor J. A. Fleming, F. R. S., one of the most eminent radio scientists in the British Empire. Dr. Fleming is the inventor of the Fleming valve—an important device which is known as the basic principle of the vacuum tube. He is holding a radiotelescope receiver, and is explaining to a class of radiomen how it works.

Vast Increase in Broadcasting

AMAZING figures, applying to the rapid expansion of popular and commercial interest in radio telephony, appear in the comprehensive survey of radio in its merchandising and advertising possibilities, prepared by Arthur Wiesenberg, director of the Bureau of Research and Information of the National Retail Dry Goods Association.

Broadcasting stations of the 360-meter wave length number now well over 100, an increase of more than 50 per cent within less than one month. Department store broadcasting stations of this class throughout the United States have increased 100 per cent within the one month period and constitute nearly 13 per cent of the total number. There are listed in the report 202 manufacturers of radio apparatus, including 34 plants pro-

ducing complete receiving sets; 85 manufacturers of accessories and special units for receiving sets; 23 manufacturers of raw materials and parts used in construction of radio apparatus, and 34 manufacturers of A and B batteries and recharging devices.

Of all merchandise, the association points out, radio is essentially a service business. Radio equipment is so varied in nature and use; the radio art is still so largely in process of development, and the instruments required are of construction and adjustment so delicate that stores which would successfully deal in radio goods must be prepared to give real service and to stand behind the merchandise sold. Knowledge of the principals of radio telephony, and a sales force especially intelligent and trained, are indispensable.

The association informs the merchant fully as to the underlying principles, and supplies the latest data compiled with regard to radio in its national aspects. The directory lists all broadcasting stations licensed by the government to broadcast, on a 360-meter wave length, news, music, lectures, market reports and time signals; and it lists, besides, amateur stations broadcasting intermittently, and occasionally, on 200 meters.

These latest figures make it evident that radio is not only past the 100-station mark but is well advanced in the second hundred. The 360-meter stations listed, number 105. In the Atlantic Seaboard States there are 28 stations of 360 meters; in the Middle West there are 36; in the Pacific Coast States, 36; and in the Gulf States, 5.

The 360-meter stations include even one church—the Church of the Covenant in Baltimore.

Making Signals Louder with Two-Stage Amplifier

By George W. May, R. E.

RADIO WORLD recently described a regenerative set which was made by hundreds of people. Their enthusiastic letters voice its efficiency. There is no question that many folks are not satisfied with just a mere detector, but are anxious to construct a two-step amplifier. Many requests for this information have been received and we publish herewith a description of a two-step amplifier which most any one can build with the necessary equipment.

The following material is necessary: One piece of bakelite or panel material, 10 inches long by 6 inches wide; two vacuum-tube sockets; two amplifying transformers; two amplifying tubes; two filament rheostats; one double and one single telephone jack; one plug for jack; about half a dozen binding posts, and the necessary screws and nuts.

If the beginner starts to construct this two-stage amplifier, he should read the following, by Mr. George W. May, and observe the rules he has laid down as any little error will offset the efficiency of the set. On completion make sure that every connection is correct. This can be done if the amateur studies every little move.—*The Editor.*

BY means of the jacks the builder of a two-stage amplifier can use either the detector tube alone, or both steps of amplification. Another jack can be used between the first and second steps; but this is really unnecessary, for, if loud signals are wanted, both steps will be used anyway. The first step will give signals but little louder than the detector alone. Besides, the wiring is simplified a great deal using only the two jacks, instead of three.

The diagram shows the location of the parts on the panel. The jacks are

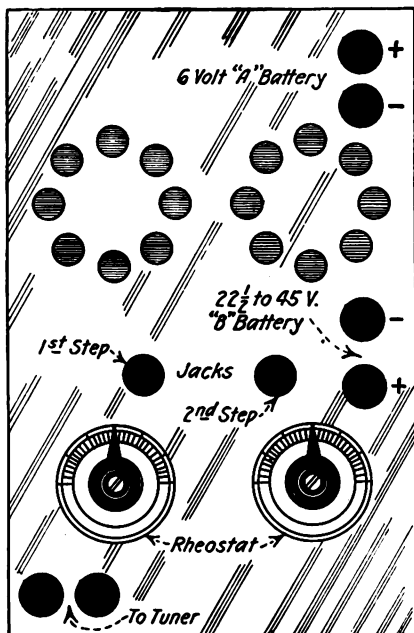
placed alongside each other in the center of the panel. The peep holes are simply a ring of holes made with a small-size drill. The filaments of the tubes are observed through them. The tube sockets are screwed down on the base of the cabinet, directly behind the rheostats. The amplifying transformers are mounted on the far corners of the base, and should be separated as far as possible. This will reduce the tendency to howl, which often occurs in amplifiers in which the transformers are too close together. After all the holes have been drilled, it is well to "grain" the panel. A piece of emery cloth is wrapped around a block of wood, and is then simply pushed up and down the length of the panel, with straight strong

strokes, until the surface is finished. This is rather a tedious job; but the grain of the panel will prevent finger prints from showing. In general, it gives the instrument a better appearance.

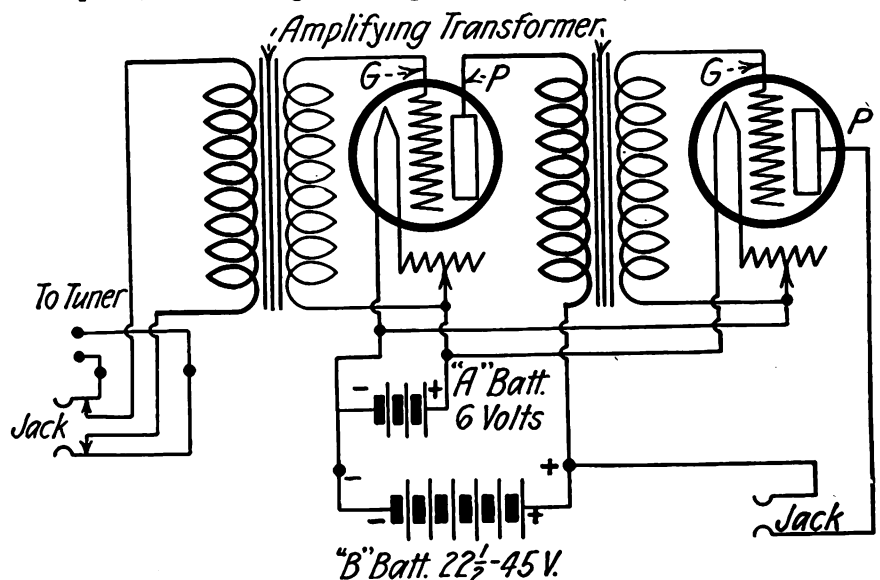
Before beginning the wiring, examine the double-circuit jack carefully. There are two outside springs with bent ends. These make contact with the tip and body of the plug when the plug is taken out, these springs tend to come together and make contact with two inner leaves, indicated in the hook-up by the lines with the arrows on the ends. The outside springs are connected to the phone posts on the tuner, and when only the use of the detector is desired, the phone plug is pushed into this jack as far as it will go.

To use the amplifier remove the plug from the double jack and push it into the single-circuit one, which is connected in the plate circuit of the last tube, as shown. The primary posts of the amplifying transformers will be found to be marked with small P's; the secondary posts will have the letter G next to them. Be careful not to put the primary where the secondary belongs. It is very easy to make mistakes with complicated hook-ups like this, and one wire in the wrong place will cause no end of trouble.

The same storage and high voltage batteries are used for both tubes. This is the most economical and simple method of connection. The voltage of the B battery should be 45 or more; the higher the voltage, the greater will be the amplification obtained. With values over 100 volts, the use of the grid battery will often greatly increase the strength of the signals. Simply connect a small flash-



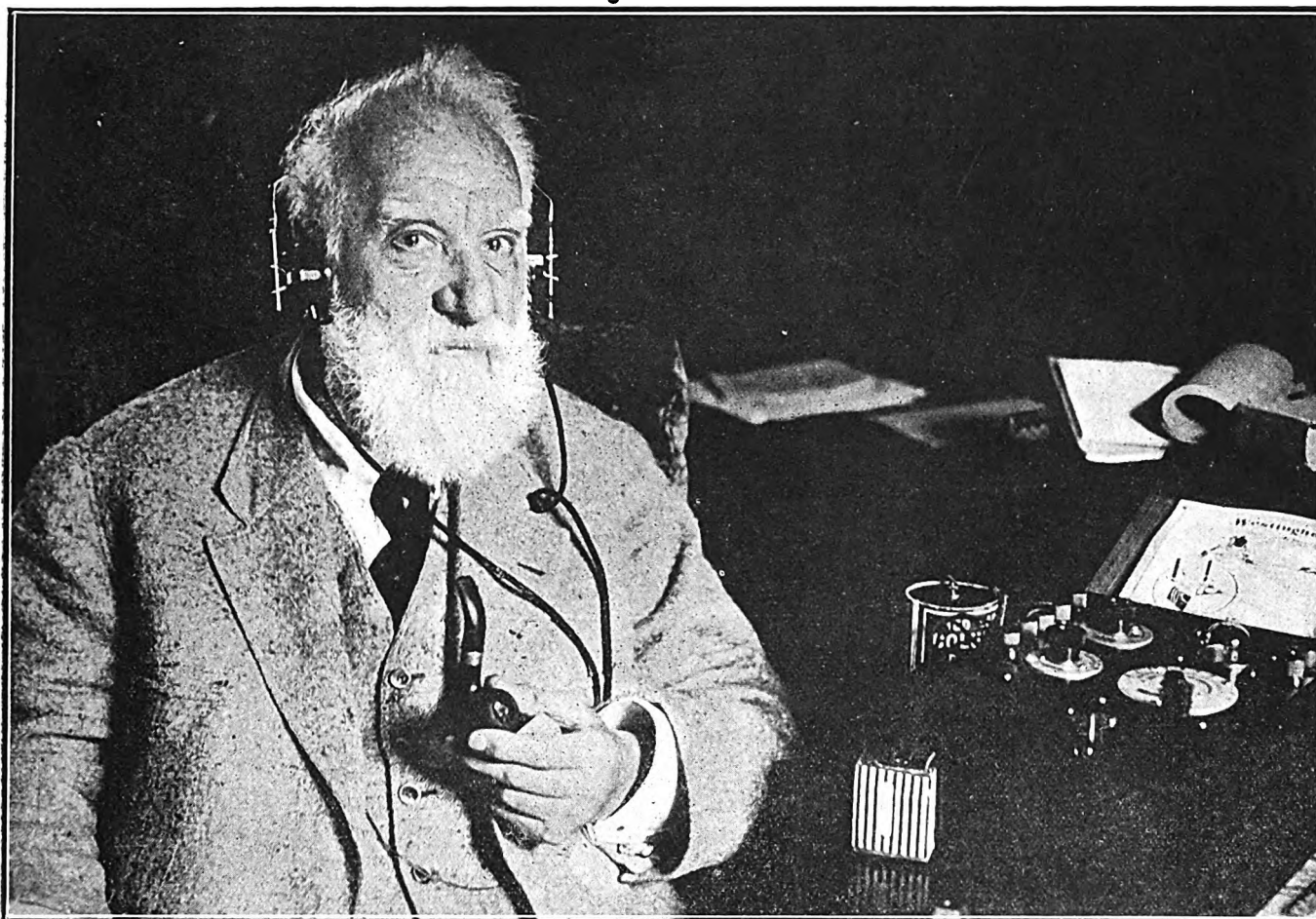
This illustration shows how the front panel of the two-step amplifier should appear. Note the position of the rheostats, jacks, and binding posts. Suggested by George W. May. Drawn by S. Newman.



This diagram is in the nature of a blueprint—a guide for the amateur builder. Be very careful to look over all the connections. Your result will depend largely on your accuracy. Suggested by George W. May. Drawn by S. Newman.

"Telephone a Nuisance; Radio a Joy!"

---Says Alexander Graham Bell, Inventor of the Telephone



(c. Underwood & Underwood)

Alexander Graham Bell, finding the telephone—his own invention—so great a source of annoyance that he had it removed from his home, has an absolutely opposite opinion regarding radio, which, he declares, is a source of unlimited enjoyment. The eminent inventor who passed his seventy-fifth birthday recently, finds a comfortable chair, a good pipe, and a well-fitting head set about as much as one can expect in order to call it the end of a perfect day—particularly if the broadcasting program is a good one.

Making the Fixed Condenser Work

For best results with a receiving set be sure to have a small fixed condenser connected across the head set. This will sometimes help a crystal set considerably. A fixed condenser of this type may be made from two pieces of tin foil about 2x2 inches.

Place a piece of paper between the tin-foil sheets and roll it up tightly. Before rolling it up, however, insert two small pieces of wire, one from each end, in such a way that each wire makes contact with one of the pieces of tin-foil. Care must be taken

to see that the tin-foil pieces do not touch each other; also that the paper is not torn by the wires. The tin-foil sheets must not touch each other at any point. After the condenser is finished, it is a good plan to immerse it in hot paraffine until it is thoroughly impregnated. This will strengthen and increase the condenser.

(Continued from preceding page)
light cell directly in the grid circuit, with the negative terminal connected to the grid. This battery should be variable, and will have to be experimented until best results are obtained.

The filaments of amplifying tubes are usually burned dimmer than those of detector tubes, so the actual temperature will have to be carefully adjusted with the filament rheostats.

No doubt the average layman will have to do a little experimenting, in order to obtain the right amplification with a given amount of battery. The experimenter should try out various voltages of his B battery, starting with about 30 volts and working up to 60 volts. Whenever the greatest amplification is noticed after the variations have been attained, stop at that particular point.

500 Cycle Current for Ships

On shipboard installation, a 500-cycle-current supply is used. This gives 1,000 sparks per second, 1,000 movements of the telephone diaphragm at the receiving end, which resolves itself into a 500-cycle note being heard. This high-spark frequency is used because of the fact that more sound is heard between 400 and 600 cycles, for a given amount of input energy.

The Radio Primer

A. B. C. for the Beginner Who Must Have the Facts Put Plainly and Tersely, and all Terms Fully Explained

The Beginner's Catechism

By Edward Linwood

WHEN purchasing vacuum tubes, the dealer mentions certain tubes by number asking whether the purchaser wishes a "200" or a "201." What is meant by these numbers?

Some makes of tubes are catalogued by numbers selected by the manufacturers to distinguish one type from another. To these firms the selection of the specific numbers may or may not have a definite meaning. But to the amateur "200" means a "soft," or detector tube, while "201" refers to a "hard," or amplifying tube.

* * *

What is there about a tube that makes it "soft" or "hard?"

These two terms merely refer to the degree of vacuum inside the bulb. A tube with a high vacuum, that is, one with practically no air or gas within the glass, is a hard tube. Tubes containing gas are called soft tubes.

* * *

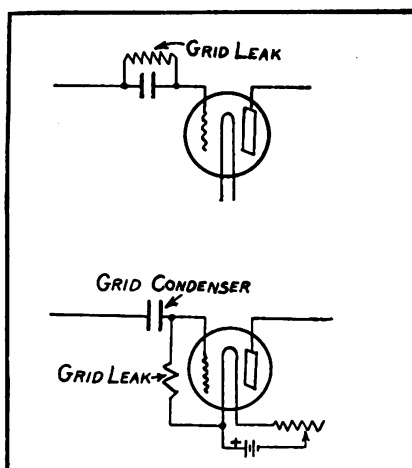
Why are not all vacuum tubes made without gas; meaning, why are not all tubes hard?

A certain amount of gas in a tube makes it more sensitive by causing it to be critical. By critical is meant a condition which calls for an exceedingly fine adjustment. The amount of current fed to the filament and the amount of the voltage on the plate must be gauged to certain points when dealing with critical tubes.

* * *

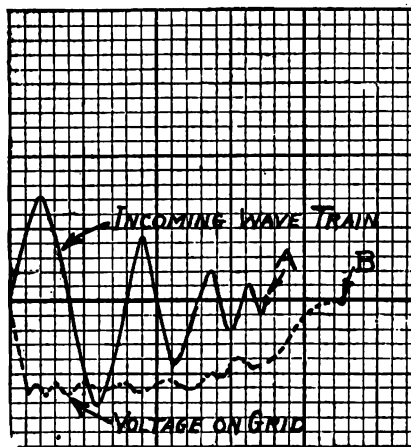
There is a small, flat device called a "grid condenser and leak." What is inside the thing, and what is it for?

When a train of waves enters from the aerial through the secondary of the loose coupler, or variocoupler, the grid is affected with an alternation of positive and negative waves. As previously described in the paragraph on the action of the grid, the flow of electrons from the filament is helped when the grid is positive but is hindered or prevented when the grid is



Upper diagram—Vacuum tube with grid leak shunted around the grid condenser. Lower diagram—Grid condenser shunted around the filament and grid. Drawn by E. L. Bragdon.

negative. For our purposes, it can be considered that, when the grid is positive, the little charges of electricity exchange places with the negative charges flying off from the filament in the form of electrons. But when the grid is harboring only negative electricity, it is held there a prisoner. There is no place for these charges to go.



Distance between points A and B represents the time required for charge to leak from grid through grid-leak. Drawn by E. L. Bragdon.

The little ups and downs of the radio wave, however, are coming in thick and fast and the grid is endeavoring to take care of them. It has no trouble getting rid of the positive halves of the waves because they fly over to the filament, but the negative halves remain where they are. After a short time—measured in thousandths of a second—the grid is pretty well crowded with these negative charges. So, as soon as the wave train ceases—and before the next train appears—it gets rid of these charges by making them leak through the most convenient hole. The grid leak is for the purpose of taking care of the negative charges on the grid. Unless this is done, the action of the tube as a detector would be unsatisfactory if not impossible.

The use of the condenser in the grid circuit insures that the voltage on the grid between the trains of waves will always be zero. During the trains of waves, the voltage is negative. Without this condenser, the grid would have a potential depending on the position of the rheostat in the filament circuit. The result of the grid condenser is louder signals.

* * *

If the charges can leak away through the grid leak after the waves trains have stopped, why cannot they disappear in the same way during the wave trains?

Because of the overabundance of the negative charges. These charges fall on the grid from both antenna and filament. To leak away through the grid-leak during the wave train, the charges would have to be more powerful than the incoming charges. When they leak away they travel in the opposite direction from the incoming waves, hence they would have to "buck the stream" to be successful.

* * *

What is the grid condenser made of?

A few square inches of tin foil separated by a good grade of waxed paper, both materials being folded over several times to conserve space. Sometimes mica is used to separate the tin foil.

* * *

What is the grid leak made of?

The most common grid-leak consists of a narrow strip of paper which has been soaked in a lamp-black solution, or a bath of black waterproof ink. Other types of grid leaks are made of a glass tube which has been coated on the inside with a thin film of a semi-conducting substance.

How to Make Your Own Condenser

By George W. May, R. E.

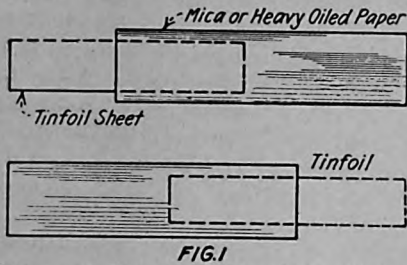


Figure 1—How the tin foil should be placed. Dotted lines indicate the tin foil. Even lines indicate the mica. Suggested by Geo. W. May. Drawn by S. Newman.

WHILE adjusting their sets many amateurs have occasion to use a fixed condenser. At times, it is difficult to purchase one. Therefore, let me enlighten you regarding fixed condensers. The action that takes place between two conducting surfaces separated by a dielectric using tin foil, mica sheets, glass or paraffine paper are employed in many ways in radiotelegraphy. Such a device is called a fixed condenser. These fixed condensers are said to have a certain capacity. In building condensers, the capacity is figured by the number and the size of conducting surfaces and the dielectric separating them. This capacity is generally calculated in microfarads—the farad being too large for radio work, the capacity depending upon the size and number of the conducting surfaces and the di-

electric between them. This may be of a fixed or variable capacity, depending, of course, on the construction. If the elements are stationary, it will be of a fixed capacity; if they can be moved they will be of a variable capacity.

The fixed condenser, which is shunted across the telephones, will have the effect of taking the weak electric impulses which have been rectified by the detector and storing them up in this same condenser. After the condenser is fully charged, it discharges them more evenly into the telephone receiver. This will have the effect of increasing the signal audibility, which is always desirable. This piece of apparatus is very simple and easy to construct; but some care must be taken to smooth out the tin foil to avoid blisters, and the sheets must be uniform.

A condenser for this purpose can

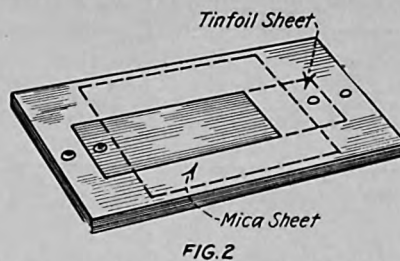


Figure 2—The mica and tin foil on a piece of insulating material. Suggested by George W. May. Drawn by S. Newman.

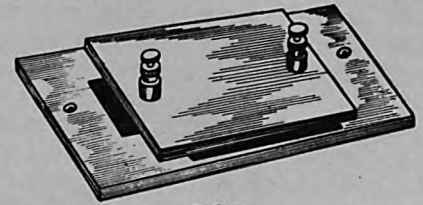


Figure 3—The condenser completed, including binding post and box. Suggested by Geo. W. May. Drawn by S. Newman.

be made by most anyone. By securing the following material we will have approximately the capacity of a .002 mfd. condenser: Purchase 7 sheets of tin foil $1\frac{1}{2}$ inches long by $\frac{3}{4}$ of an inch wide, 7 sheets of mica, 1 inch wide by $1\frac{1}{4}$ inches long, the mica running about three-thousandths of an inch in thickness. Take a piece of mica and lay on a table. Next take a piece of tin foil and lay it in such a manner that it laps over as Figure 1. Follow these operations until you have alternated the tin foil strips each time. Here you will notice that, when completed, there will be three tin foil taps on one side and four on the other. By bunching each of tin foil laps on each side, they then can be connected to a binding post, and the other sides bunched to another binding post. They can be compressed and placed in a box ready for any type of receiver.

Radio Terms at a Glance

TUNGSTEN—One of the metallic elements found in the earth. Used for the filament and grids in many types of vacuum tubes.

TANTALUM (*tant-a-lum*)—Another metallic element mined in the earth. Used for the grid in some makes of vacuum tubes.

ELECTRONS (*ee-leck-trons*)—The smallest known charge of electricity. Always negative. Given off from a hot metallic substance when the latter is heated to incandescence.

MILLIAMPERE (*mil-ee-amp-er*)—A sub-unit of electric current flow. Equal to one one-thousandth of an ampere.

ELECTRIC CHARGE—A quantity of electricity at rest; i. e., without motion.

DISTRIBUTED CAPACITY—The condenser effect produced between adjacent turns of wire in tun-

ing coils and other inductances or coils of wire carrying an electric current. This form of capacity is called "distributed" because it is not localized, as in a variable condenser.

COUPLING—Refers to the relative position of the primary (outer) coil of a variocoupler or loose coupler and the secondary (inner) coil of the same tuning inductance.

LOOSE COUPLING—When the secondary of a loose coupler is withdrawn from the primary or when the variocoupler rotor is turned at right angles to the stator.

Rotor (*ro-tor*)—The inner, revolving part of a tuning coil.

Stator (*stat-or*)—The outer, stationary part of a tuning coil.

TIGHT COUPLING—So called when the secondary coil is in its normal or most compact form with regard to the primary. In the case of the

loose coupler, the circuit is said to be tightly coupled when the secondary is pushed entirely within the primary. The variocoupler is tightly coupled when the rotating secondary occupies a parallel position with respect to the primary, which is the same as when both coils are concentric.

Primer Notes

Amateurs should know that using a sixty-cycle input, giving 120 sparks per second, causes the telephone diaphragm to vibrate 120 times per second, giving a resultant note of sixty cycles. This means that if one listens to the spark tone or frequency at a transmitting station, and then listens to the same station when it is sending, the same note will be heard.

A story is told of an amateur who, on visiting the Arlington Naval Radio Station, at Washington, D. C., remarked, in surprise, that the spark sounded the same down there as it did at home, five hundred miles away.

Hope for Secrecy in Radio Waves

EXPERIMENTS in sending messages by short-wave directional wireless-apparatus prove that 20-meter wave lengths are capable of providing point-to-point directional commerce over exceptionally wide ranges. This statement was made by C. S. Franklin, of the Marconi Company, in an address before the Institute of Electrical Engineers, London, May 5. Such service, says Mr. Franklin, would be comparatively secret as compared with the usual non-directional type of transmission. In other words it would prevent general listening-in, to a certain extent, on hundred-mile distances.

The "Daily Mail" of London, considered Mr. Franklin's prediction of sufficient importance to ask the opinion of Senor Marconi. The noted inventor and radio expert, however, sounded an important note of warning:

"Scientists," said Senor Marconi, "cannot employ the words 'absolute' or 'finite' to their investigations and discoveries. What we do not know to-day we may know to-morrow. That

is why I am not prepared to say that absolute secrecy can be guaranteed with regard to wireless. It was twenty-five years ago that I first experimented with regard to communication between two given points without the communication being picked up elsewhere; but then there came the fascinating development of speaking to the world at large by broadcasting, and I dropped the experiments.

"During the World War, I took them up again for the benefit of the Italian Navy. Mr. Franklin assisted me, and we were able to communicate over a distance of six miles without being overheard. Since then Mr. Franklin has carried on his experiments, and to-day we can communicate in this way over 100 miles, and I see no reason why in the course of time we should not be able to speak by this method across the Atlantic. I will not say that the conversation will be absolutely secret as between speaker and listener; but, to-day, only a station directly in line between the two points and tuned up to the proper length could intercept the message."

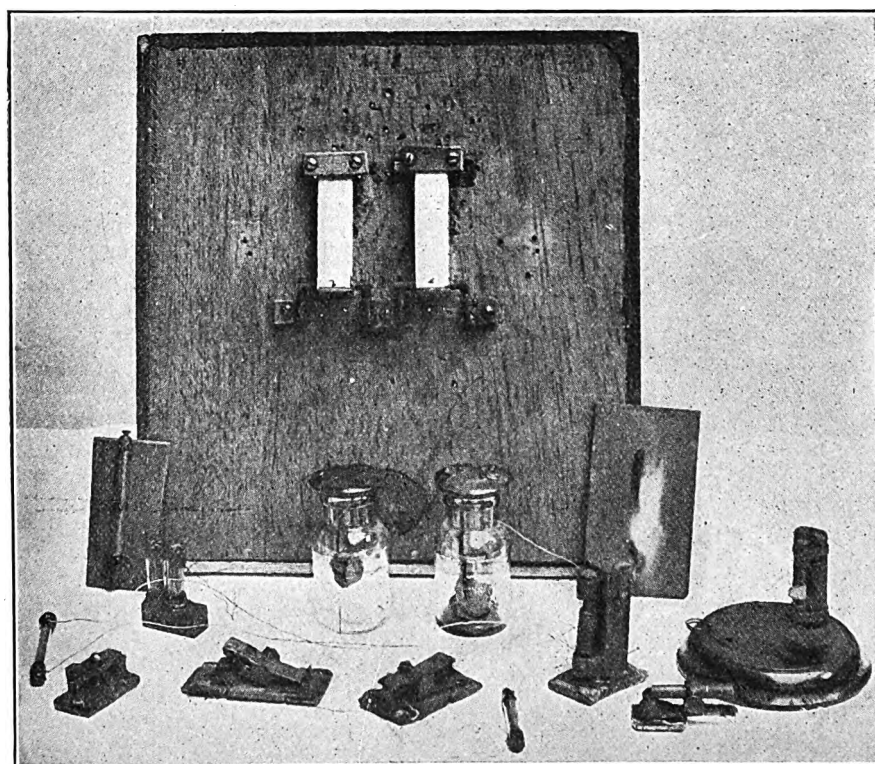
In regard to ordinary wireless telephony across the Atlantic, Mr. Marconi said:

"That is quite near—much nearer than some people think. Some time ago we got a few words across, and, since then the wireless stations on both sides of the Atlantic have been improved, and, as they have been improved for telegraphy, so we have carried on experiments for telephony."

There is another development to which Mr. Marconi is looking forward with an open mind. Next month, Mars comes comparatively near the earth, and he has determined to "listen in" for what he described in 1920, when they were heard by him, as those "very queer sounds and indications which come from somewhere outside the earth."

"I shall be in America next month and shall certainly 'listen in' for these mysterious sounds. They have not been reported for some time, and there is at the moment no indication, so far as I am aware, that they are likely to begin again."

One of the First Wireless Sets Made



(c. Wide World Photos).

A romantic radio discovery was made recently in London, England, when a wireless set, apparently constructed by Professor D. E. Hughes, was brought to light and placed on exhibition in the Science Museum, Kensington, near London. The photograph shows the crude elements with which Dr. Hughes had to work. No doubt he was regarded very much in the light of an ingenious but misguided person. Compare the various parts of his invention with the marvelous apparatus of to-day.

Uncle Sam's Radio Lawmakers

THIS is the personnel of the Department of Commerce Conference on Radiotelephony appointed by Secretary Hoover, which will soon consider the draft of the radio bill which Congressman White will introduce in the House of Representatives:

Dr. S. W. Stratton, chairman, director of Bureau of Standards; Major-General George O. Squier, Chief Signal Corps, U. S. A.; Captain Samuel W. Bryant, U. S. N.; J. C. Edgerton, Superintendent, Radio Service, Post-Office Department; W. A. Wheeler, Bureau of Markets and Crops Estimates, Department of Agriculture; Representative Wallace H. White, Jr., of Maine; R. B. Howell, Omaha, Nebraska; Dr. Alfred N. Goldsmith, Secretary, Institute of Radio Engineers, New York; Mr. Hiram Percy Maxim, President, American Radio Relay League, Hartford, Conn.; Professor L. A. Hazeltine, Stevens Institute of Technology, Hoboken, N. J.; D. B. Carson, Commissioner of Navigation, Department of Commerce; Professor C. M. Jansky, Jr., University of Minnesota; Senator Frank B. Kellogg, Minnesota; Edwin H. Armstrong, Columbia University.

Tuning as Applied to Telegraphy

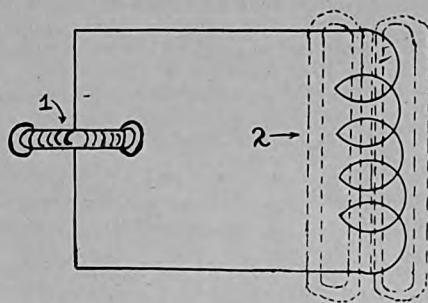
By *Walter J. Howell, A. M., I. R. E.*

THERE are only two main factors to be considered in regard to Tuning, Wave Length, and Resonance—Capacity and Inductance. Capacity means the ability of an electrical conductor to hold a charge of electricity in what is called an *electro static form*, while inductance means the ability of an electrical conductor to produce magnetic lines of force about itself when traversed by a current of electricity. Practically every conductor of electricity has capacity and inductance; but apparatus can be built so that either one may predominate, such as a number of metal plates insulated from each other forms a condenser while a coil of wire would form a lumped inductance.

An oscillating circuit consists of capacity and inductance and is usually in the form of a condenser connected to a coil of wire. See Figure 1. If a current of electricity is induced into this circuit, the current will flow back and forth in the circuit until the original energy is dissipated in the form of heat, etc. The time it takes for one complete oscillation depends on the amount of Capacity and Inductance in the circuit. If both are of large electrical value, the oscillations will be slow; or, if of small electrical values the oscillations will be very fast in their movements.

One complete oscillation in a transmitting set will throw off, or radiate, two waves, a positive one and a negative one. The distance in meters between two positive or negative waves is called the wave length. A 360-meter wave means that there is a distance of 360 meters between like points in the train of waves being radiated. Radio waves, electricity, and light waves travel at the same speed, 186,000 miles a second. This is, roughly, 300,000,000 meters; so it will be seen that, by dividing wave length into this number, the frequency per second will be the answer. The lower the frequency the longer the wave length, while the higher the frequency the shorter will be the wave length. It is all a question of vibration and time.

When two circuits are in resonance, it means that they have the same period of vibration and only under this condition is the most energy drawn from the transmitting circuit by the receiving circuit. There are various ways to tell when two circuits are in resonance; but the one most familiar to the operator is by



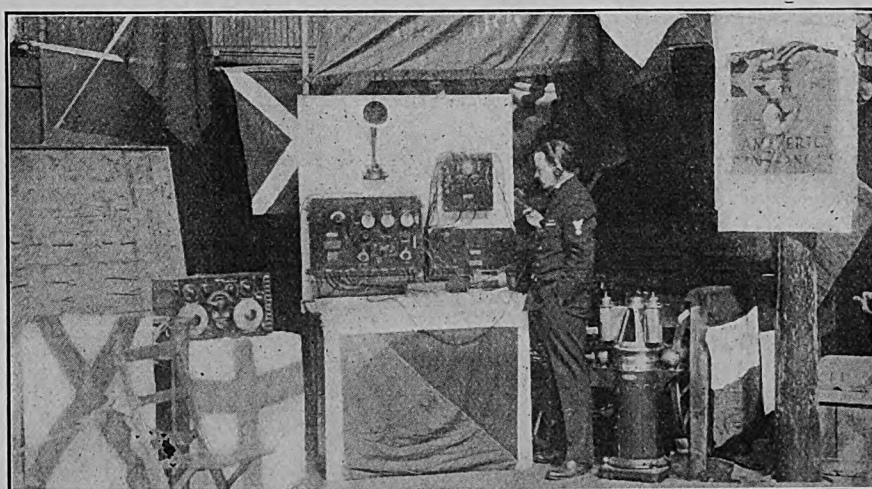
Electro-magnetic lines about a coil and electro-static lines of force between condenser plates. Drawn by Walter J. Howell.

means of head telephones and all that is done is to adjust the receiving set until the loudest sound is heard in the phones and the set may be said to be in resonance with the transmitter.

It will be noted, on trial, that a receiving set can be adjusted to various combinations of capacity and inductance and still be in tune; but, usually, one particular combination will give the loudest signals. This merely means that the type of detector being used at the time is having applied to it the proper voltage or amperage required for proper functioning. Consistent study of the subject of resonance and wave length will go far to explain many of the curious things that newcomers in the radio field hourly find.

There is a peculiar fact about radio receptors that is not known to the general radio public: only about fifty per cent. of the received energy can be successfully extracted from the aerial circuit. If an attempt is made to extract more energy, weaker signals will be the result. The reason for this is that extracting energy from an oscillating circuit is the same as placing a resistance in the circuit and the net result is a decrease of current. That is why loose coupling usually gives louder signals than close or tight coupling. Resistance in the circuits of a receiver tends to cause it to tune broadly, as is the case with a crystal set. A large part of this resistance is caused by the fact that a crystal, due to the necessary connection, extracts a great amount of the received energy from the aerial circuit; while in the case of the vacuum tube, the reverse is true. A receiving circuit using tubes in an oscillating condition tends to nullify the circuit resistance. In other words, energy is pumped into the aerial circuit to make up for the amount extracted. Money deposited in a bank at the same time that an equal amount is drawn out, results in no loss to the total. In the case of a crystal detector, it draws out money but never replaces it.

One of Uncle Sam's War Secrets



(c. Keystone News Co.)

Naturally the boys in blue are always on the job when it comes to showing the American public just what Uncle Sam has behind the screen. Henry Gabrielson, chief radio electrician, U. S. N., is photographed with a radiotelephone transmitter and receiver combined. At a recent radio show, this equipment proved its merits when a few concerts were given direct from this transmitter under the supervision of Mr. Gabrielson. Although this equipment is a wartime invention, it gives the public an idea of the secrets Uncle Sam had under his wing during that period of the war when the clouds were blackest.

Answers to Readers

Tell me how to prevent interference from two receiving sets?—E. C. Ithaca, N. Y.

According to your diagram you are simply detuning each other at times when both of you are in resonance with each other thereby making your tubes oscillate. Erect your aerials so they are at right angles to each other. It is a fact that when two aerials are close together, especially when both are seeking the same waves, the tubes will perform as explained. Run your wires at various angles.

Can I get any results by using an aerial 20 feet long, suspended from a window of an office building 12 stories high, located at 42nd Street and 5th Avenue, New York?—Inquirer.

Try for a longer shot of an aerial if possible. Remember the longer the lead the better the results. Referring to your set, concerts may be received all right, but a good tube set would be preferable; in fact, a better investment.

I would like information on how to construct a radio outfit.—G. G. C., Antigonish, N. S.

Watch RADIO WORLD weekly for construction of receiving sets.

Will an indoor aerial work in New York City? When will the new broadcasting station start in New York?—Harry Miller, New York City.

Indoor aerials will work anywhere if sufficient amplification is used. Announcement will be made of the new broadcasting stations as the information is available. Read George W. May's articles on eliminating the aerial for the use of the loop and radiofrequency amplifiers, in RADIO WORLD.

I have loose coupler and galena detector, but all I hear is code. Why?—Paul Goshen, Erie, Pa.

Put variable condenser in series with antenna and get a good, or a better, crystal. Adjust your set properly.

I have a crystal set that works very well; but, once in a while, I hear howls and hums. What is the cause?—A. Bernstein, Newark, N. J.

You are probably located near some transmitting set that is testing. That is what you hear. You may also have a loose connection somewhere, as this will sometimes cause peculiar noises in the receivers.

Where is station 2XY?—Max Hoch, Brooklyn, N. Y.

This station is the New York Telephone and Telegraph Co., 24 Walker Street, New York City.

Can I add two steps to the steps of an Aeriola Senior set?—Russell Simonson, Glen Head, New York.

You may add amplification to any audion detector.

In trying to make a regenerative set, I have put tickler in main inductance and am puzzled as to how the last two sections of 20 turns each are connected?—James Powell, Nantucket, Mass.

Make the large group of turns the primary, in series with a variable condenser and aerial and ground. The two small sections are your secondary and should have a variometer in series to form the sec-

Owing to the large numbers of questions received from readers it is impossible to answer all in this number. Your replies will appear in the next or future numbers of Radio World.

ondary circuit which connects to grid and filament of vacuum tube.

Will variocoupler work with a crystal set? How is it wound?—Harry Gordon, New Dorp, L. I.

Yes. Wind one coil of 70 turns of No. 24 wire on cardboard tube 4 inches in diameter and another coil of 40 turns on tube 3 inches in diameter. This when assembled will make up your variocoupler.

In making the small match-box receiving set, will it make the set any better if I brought out a tap about every 20 or 30 turns instead of every 50?—Fred Bruns, Brooklyn, N. Y.

The additional taps will make the set tune better and generally improve it.

What station is WVP?—William Morrison, Cedar Hills, N. Y.

WVP is the United States Army broadcasting station at Ford Wood, Bedloe's Island, N. Y.

I live in Brooklyn and read RADIO WORLD each week. I would like to know how many miles I can hear with an 0.3000-meter receiving set?

Can I use 19-strand Silicon bronze wire? How long must my aerial be?—J. J. E., Brooklyn, N. Y.

Your first question is not self-explanatory. What is your detector-tube or crystal? Are you using stages of amplification? Send further information about this. No. 19 wire is all right. Have your aerial about 120 feet long, in one stretch.

Is it possible to receive on a wave length of 360 meters with the loose coupler described on page 14 of RADIO WORLD, dated April 22?—J. A. Walsh, Charlestown, Mass.

No. Frederick J. Rumford tells you in his second paragraph, that it is capable of receiving on wave lengths from 800 to 2,400 meters. Would advise you to write to Mr. Rumford, whose address is 58 Bickford St., Roxbury, Mass.

Where are stations KYM and WIR located?—Harold E. Peck, Providence, R. I.

These stations are not listed. Write to Radio Service Bulletin, Bureau of Navigation, Washington, D. C., for further information.

I have a small transformer which is used on 110 A. C., to ring a door bell. Could I use this transformer and 110 A. C. in place of a B battery for tube work and also, A battery?—H. I. I., Wilkes Barre, Pa.

You cannot use A. C. in either case. Stick to your batteries.

I have a pair of 3,000-ohm receivers, a variocoupler, and a crystal detector. I hear code signals, but nothing on the concerts. What do you think is the trouble? My aerial is 200 feet long.—Charles Oetjen, Floral Park, N. Y.

You are too far from a broadcasting station for the reception of concerts, but think you should hear WHN at Ridgewood, Long Island. Place a variable con-

denser across the secondary of the variocoupler; or, for accurate and possible results from the further radio broadcasting stations, if possible, get yourself a vacuum-tube outfit as you can add an amplifier with far greater results than with a crystal detector.

Where is 1 CAA located and by whom operated, also 1ZAA.—G. H. Rochester, N. Y.

1 CAA station is operated and owned by Lloyd G. Morse, 108 Lawton Avenue, Lynn, Mass. 1 ZAA can be had by writing to Radio Inspector, Washington, D. C.

My aerial is 75 feet long in a V-shape and 30 feet high. My set is a short-wave regenerative set with detector and one step. It has a wave length of 350 meters. My trouble is as follows: I get whistling and cannot hear the stations I want, yet I am close to them. Can get C-W stations, but not the phone stations.—A. N. T., Trenton, N. J.

Try to get your aerial to swing out, say to about 100 feet and make your lead-in towards the stations you wish to hear. That is, if you want a directional inverted L-aerial, apply different plate voltages to your plates of the tubes. If you are using radiotrons, use about 16 volts to 18 volts on detector plate and between 22 and 45 on amplifier plate. This should answer your troubles.

Will a regenerative receiver work using a telephone line as an aerial?—John Hopkins, Rome, N. Y.

You may use this but it is not advisable. Put up a single wire about 100 feet long, for best results.

What kind and what size wire should be used for an aerial?—Richard MacKenny, New Bedford, Mass.

No. 14 bare copper-wire is used for receiving aeriols. Insulated wire will work as well, but put up 100 feet.

Can I receive anything on an aerial running vertically up and down the side of a building? Can I run a wire across the street?—Lester McGregor, Egg Harbor, N. J.

You may be able to receive successfully on this aerial if your set is all right. We cannot tell you what you will receive. You cannot run an aerial across a street without permission from your city authorities.

I have an Aeriola Senior set and would like to know if I can hear WVP by merely enlarging my aerial.—Charles Horne, West Hoboken, N. J.

This will not help you to get up to the desired wave length. You will have to add some sort of a loading coil to the set.

What station is KDOW?—William Platt, Oshkosh, Wis.

KDOW is the steamship "America" experimental ship for the American Telephone and Telegraph Co.

With the enclosed hook-up I can get WJZ very well but not loud enough to use a loud speaker. What is the matter?—Milton Sackett, Brooklyn, N. Y.

Your hook-up is far from right. Apparently you have no B battery on the first step of amplification. The tuning unit is also far from efficient. You should use regeneration for better results.

Radio and the Woman

Latest Gossip About the Feminine Enthusiasts

By Crystal D. Tector

THE women members of the New York Mozart Society demonstrated their interest in radio by giving a broadcasting program at their annual breakfast at the Astor Hotel. Two hundred women of New York City's East Side, mothers of children cared for during the year by physicians of a clinic which is largely supported by the society, were special guests. The new public-address system, with the loud-speaker amplifier of the Western Electric Company, was used in connection with the aerial now in daily use on the roof of the Astor. Mrs. Noble McConnell, founder of the society, is pursuing the study of radio in expectation of qualifying as an amateur operator.

* * *

Books for radio clippings are on sale in the stationary section of one of New York's largest department stores.

* * *

"The world is now a vast concert hall!" exclaims a woman friend who is an opera singer.

* * *

Won't some splendid woman leader organize a campaign to install receiving sets in all charitable institutions?

* * *

The wife of a United States light-

house keeper writes that the use of radio has improved service to shipping and has resulted in better living conditions for her husband and herself.

* * *

"Static" is the newly designated name for a certain woman's recently acquired pet, which instead of proving the amiable canine she had thought him to be, has suddenly turned erratic and troublesome.

* * *

Beatrice Baskerville quotes Professor Arthur Korn, the German inventor of a system of sending pictures by wireless, as having remarked that a picture of King Victor Emanuel, of Italy, was received at the Bar Harbor, Maine, radio station, and that the German relay station at Nauen, Germany, relayed the return picture from Bar Harbor.

* * *

A woman who contemplates opening a radio store, plans to reserve a room which will serve as combination club and tea room for women radio professionals and amateurs.

* * *

A letter from a friend who lives in Milwaukee, Wisconsin, offers the opinion that it is the enthusiastic interest in wireless, shown by women of the Middle West, that is speeding up preparations for the radio show



(c. Fotograms, N. Y.)

"Won't you Tune in on My Wave Length," is said to be the title of the latest radio song. Here is Miss Field, of New York, with loud speaker and head set. Perhaps she doesn't want to miss a word. Neither do we!

to be held in the auditorium of that city at the end of June.

* * *

An invalid at Saranac Lake, New York, writes that, in conjunction with other residents of that place, she is receiving great mental and, therefore, physical benefit, from listening in on programs so excellent that it takes their thoughts off their ailments.

* * *

Girl pupils of the John Ericson Junior High School, at Guernsey St. and Meserole Ave., Brooklyn, are making a scientific study of the wireless outfit which has been installed in a classroom of the school.

* * *

A paper horn used as a makeshift amplifier, filled the temporary need for dance music at a recent impromptu radio party.

* * *

A woman visitor from France says that the amateurs of her country are getting their continuous-wave apparatus in order and that it is only a matter of a few weeks until experts will bridge the Atlantic.

* * *

At the New York Institute for the Blind, radio concerts are given. This report should include the name of every other similar institution. For what could mean more to the sightless than good entertainment which can be enjoyed simply by hearing it.



(c. International)

Mrs. Emma Freeman of Vallejo, California, who successfully operated a radio-telephone installed by the U. S. Navy at the exhibition of radio appliances given in connection with the Pacific Coast Radio Convention in San Francisco.

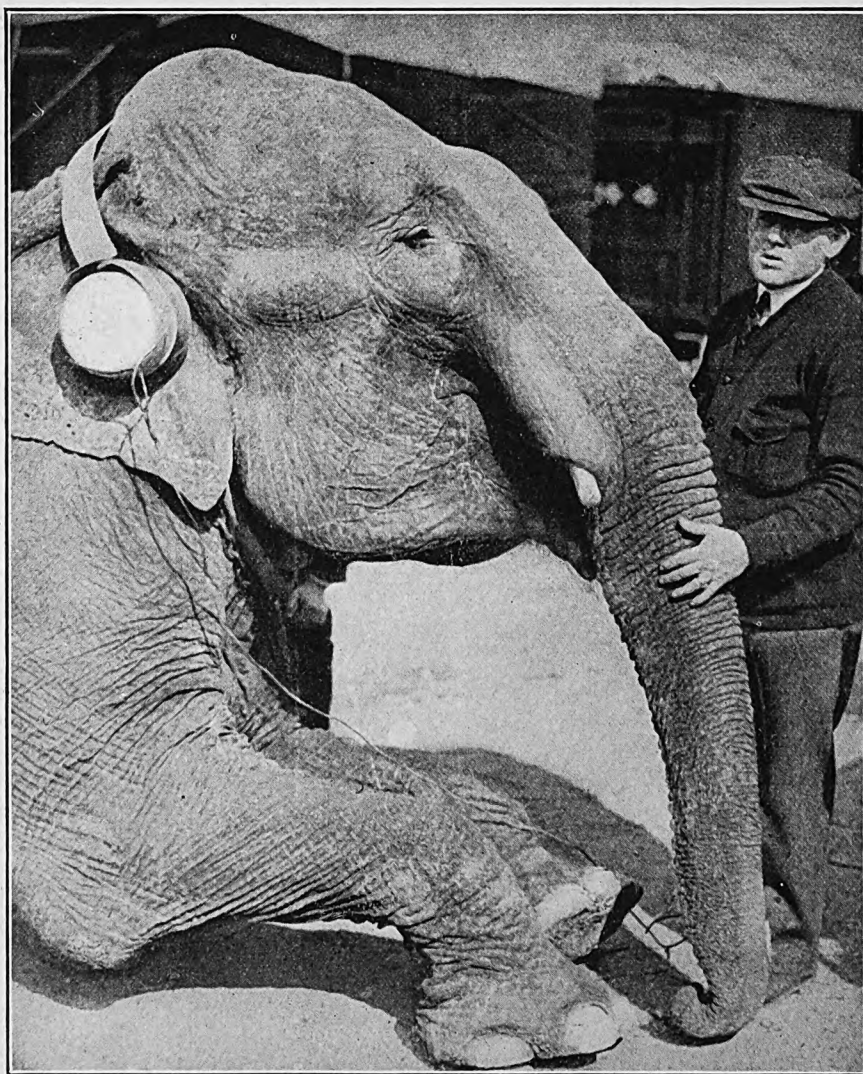
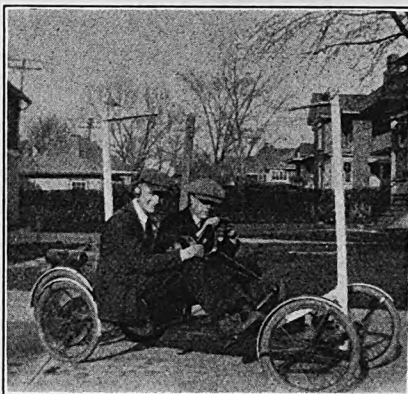
Where Fun Tunes In

Radiolaughs Caught by Cameramen



'Josephine,' the English bulldog belonging to Edgar C. Gause, Kenneth Square, Pennsylvania, listening in. "Josephine" resides at a radio station and claims to be the original canine radio fan.

John Scripps, Peoria, Illinois, sends this interesting photograph (below.) Two amateurs known as "Radio Road Eaters," rigged up a small aerial and receiving set on their "Red Bug." They got results.



(c. Fotograms, N. Y.)

"Babe" is a modern elephant. On Sunday, when he is resting, he must be entertained. A receiving set has been made especially for him. During his leisure hours, he adorns his huge headgear and enjoys the musical concerts. M. J. Denman, his trainer, is providing the same entertainment for his entire crew of pachyderms. "Babe" is part of a circus and the circus carries the radio en route. The receivers are connected with antenna at the top of the tent.

Antenna Is Still a Mystery

THE aerial is a point that has not been thoroughly cleared up in the minds of many beginners. The aerial should be composed of a wire; say, about 100 feet long. Remember, that two wires, each fifty feet long will not give the same result, and, also, that all the aerial should run in one direction only. The aerial that is full of bends is not very efficient. A straight-line aerial is far superior.

The lead-in should always be taken from one end, as the T aerial is not particularly good for receiving. The short end of such an aerial is absolutely wasted, and is not helping the set in the least. The indoor aerial is not much good unless several stages of amplification are used. It is far below the outdoor aerial in efficiency. Several people have written in, disputing this claim; but, probably, their outdoor aerials have not been constructed correctly. The indoor aerial will not work with a crystal set unless the owner is located very near the station that he wants to receive.

The wire in the aerial should be of copper of almost any size, so long as it is strong enough to support its own weight. Remember that some of the smaller sizes of wire will not withstand the rigors of a sleet storm. One does not want to erect a new aerial every few days.

Static Is Beginning to Be a Summer Nuisance

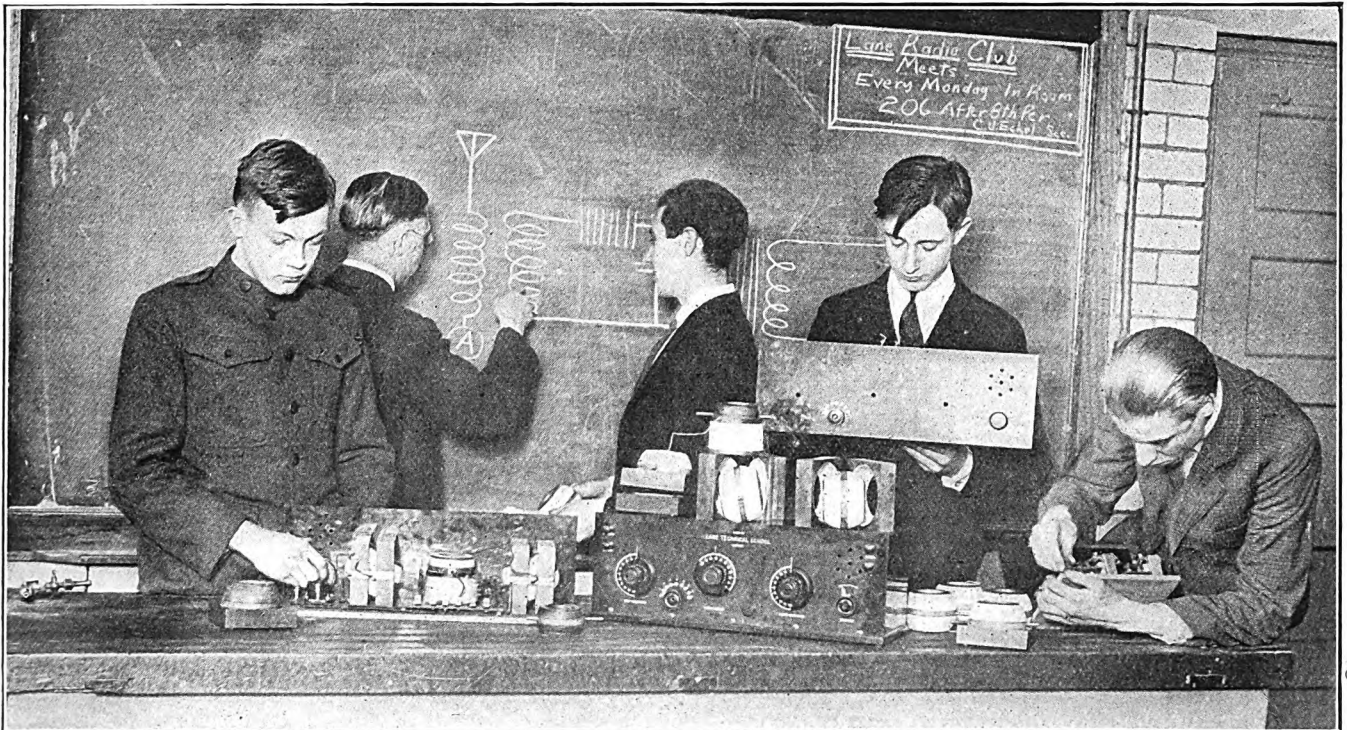
The warm nights will give beginners a sample of what a radio set will sound like in summertime. The atmospheric electricity, or static, was particularly bad on the evening of April 30. Several amateurs who recently became interested in radio, wrote us to ask what caused the peculiar crackling noises in the receivers. Static is the bane of the radio field, and, for years, inventors have searched in vain for a remedy. Up to the present time, however, nothing has been put on the market that will overcome this. In the southern districts, especially in the Caribbean Sea, radio communication is sometimes absolutely suspended. During the warm months, in the vicinity of New York, radio communication is sometimes very difficult. The operator will experience great difficulty in receiving through this static, but some work can be done unless there is a thunder storm in the immediate vicinity. If the storm should be of any intensity, ground your equipment immediately.

Radio Rules Rouse Youth to Learn



(c. Kadel & Herbert News Service)

The radio laboratory in a British elementary school at Grayswood, near Halsmere, England. It is said to be one of the most up-to-date and best-equipped in Great Britain. The headmaster, R. J. Hibbers, is a wireless enthusiast. He fitted his school with a complete radio outfit and converted an abandoned windmill nearby into an aerial tower. European schools appear to be giving the study of radio serious consideration. They claim that a good fitting in the elementary principles of the art enables a boy or girl to successfully operate the apparatus at home. Note the method of study apparently planned for the pupils of Graywood. The basic elements are first taken up; the laboratory is well equipped with apparatus; the problems are written plainly on the blackboard, and the lectures are accompanied by experiments. According to Headmaster Hibber, his pupils, no matter what their drawbacks may be in other studies, respond readily to radio.



(c. Underwood & Underwood)

Here is just what is taking place daily in many of the public schools of America. The pupils are attending a lecture on making their own instruments. Lane High School, Chicago, is undoubtedly a leader in radio instruction, but news is being received from other schools. Radio World is always pleased to receive news and photographs of radio advancement from public and private schools.

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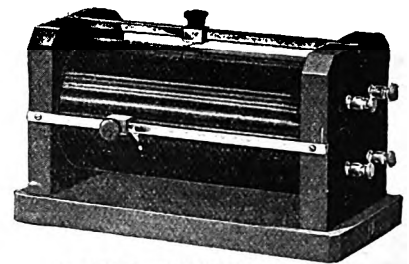
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Price \$3.00

¼" Sliders—Brass, 20c; Nickel, 25c.
¼" Slider Rods—Brass, 15c; Nickel, 20c
Crystal Detectors, nickel plated on Mahogany base, \$1.00

Contact Points, threaded with nuts, 20c dozen

Compo. cap, Nickel base Binding Posts, 7c each

Plain Nickel Binding Posts, 3½c each

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W. R. L. Elects Officers

THE Women's Radio League of America, Inc., held its first annual meeting on Tuesday evening, May 2, in the Y. W. C. A., Building, 53rd Street and Lexington Avenue, New York.

The following officers were elected: president, Miss Abbie Morrison; vice-president, Mrs. Eleanor G. Regan; Secretary, Mrs. J. Koch; treasurer, Miss Elizabeth Rhodes.

The regular meetings of the League are held on the first and third Tuesday evenings of every month at the address mentioned. Code practice for those who wish it is held at 8 p. m.

All women interested in radio are invited to attend these meetings.

something different?

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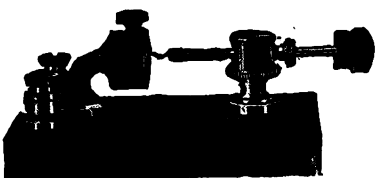
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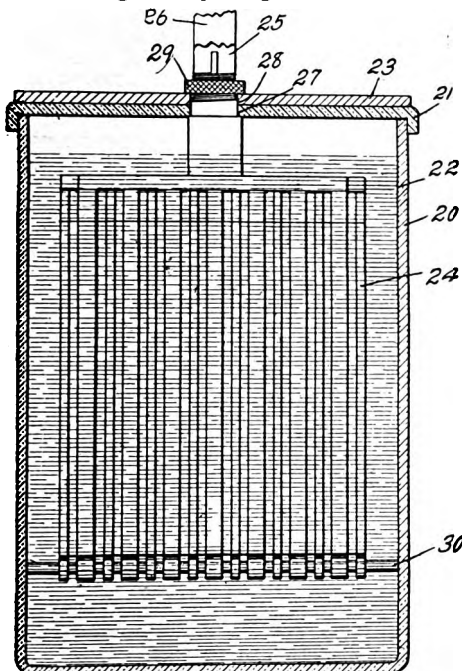
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Radio Patents

RECENTLY ISSUED

RALPH H. GRANT, Dayton, Ohio, is the inventor of improvements for storage batteries—particularly to that type wherein the plates are suspended from the cover of the jar. The general practice in the manufacture of batteries is to suspend the battery plates from the cover. These covers are made of non-conducting and acid proof materials. This material is generally fragile. The weight



Sectional view of the battery jar, cover, and support member mounted thereon. Front-elevation view of battery plates mounted on battery jar.

of the battery plates causes the covers to sag and break easily, especially when the battery jars are not handled carefully.

One of the objects of the present invention is to provide a support for the battery plates which will substantially relieve the strains on the cover. Another object of the present invention is to reduce the quantity of non-conducting material, such as rubber.

One manner of carrying out these objects is to provide a support of relatively high mechanical strength, mounted on the cover, which will take up the bending strains, and transmit the weight of plates to the battery-jar walls through the cover being subject to compression strains only.

MIHRAN M. DOLMAGE, Washington, D. C., has invented improvements in wireless duplex signaling systems. Its object is to provide a system for the simultaneous transmission and reception of signals and in particular to provide means for two-way wireless telephone communications.

To secure successful wireless duplex operation, it is necessary to render the receiving equipment free from the in-

terference by the transmitting equipment at the same station. There are a number of systems available to the art at the present time for accomplishing this purpose, some depending upon the use of two different frequencies for transmission and receiving, other systems dependent upon the use of a compensating antenna, etc. In all such cases, some approach is made to true duplex operation, but never accomplished absolutely.

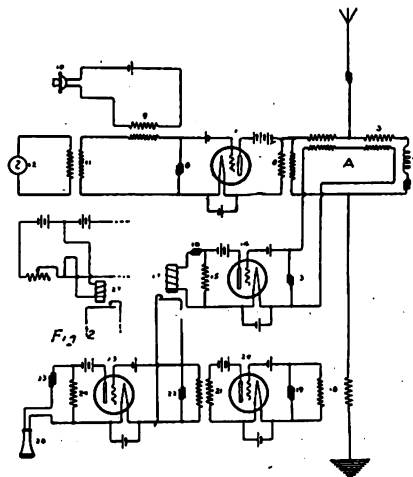


Diagram of a circuit intended to utilize a speaker's voice. It controls the circuits of the duplex system in such a way as to completely eliminate the reaction of the transmitted energy on the receiving apparatus at the transmitting station.

Where long-range wireless operation is concerned, the magnitude of the transmission current is so enormously greater than that excited in the antenna by the received waves of low amplitude, that no real hope can be entertained to secure duplex operation by local compensating circuits of differential character, so far as the reception of signals is concerned, even when a different frequency is used for receiving and for transmitting, and the receiving circuit is sharply tuned for this purpose.

How to Estimate Wave Length

A radio expert writing to "The Evening Telegram," New York, gives the following formula for estimating the wave-length of the antenna:

Add the length to the lead-in. Add to this the ground and if there is more than one wire, one-third of the length of the aerial. This is in feet. Divide this total by two and add the result to the addition above made.

Example: Length of aerial, 65 feet; lead-in, 12 feet; ground, 20 feet. 65 plus equals 97. Add 22 equals 119; Divide by 2 equals 59. Add 119 to 59 equals 178, equals wave length. Here the fixed tractor is to add to the length of the aerial, the ground and the lead-in, one-third of the length of the aerial.

WHAT KIND OF ANTENNA SHOULD I HAVE?

How long should I make it? Is a cage aerial as good as an inverted "L"? What are the latest developments in loop aeri-als? How can I build a good amplifier? What equipment will I need to receive longer wave lengths? How can I hook up my apparatus differently to get 50% better results?

These, and thousands of other important questions are analyzed in

Lefax
LOOSE-LEAF FACTS
RADIO HANDBOOK

Lefax Radio Handbook is the first real authority on all radio subjects. Lefax knows all—tells how—in every phase of radio.

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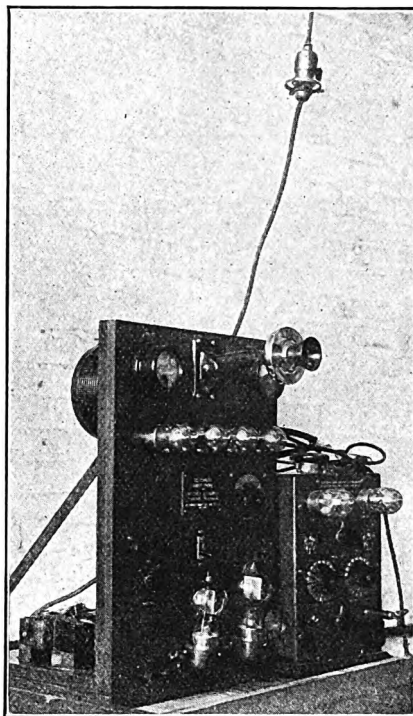


Photo by Paul Thompson.

This photograph shows a complete radio-telephone transmitter and detector and a one-step amplifier. The transmitter is connected to a 60-cycle 110-volt supply of alternating current and is ready for operating. Under normal conditions, it is reliable between 60 and 200 miles. If a receiver is connected to this one-step amplifier and the proper connections be made with transmitter and receiver one will then have a complete radio outfit.

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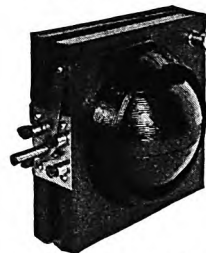
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Maxum Radio Company

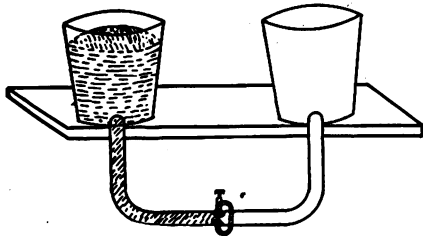
5837 WOODLAND AVENUE, PHILADELPHIA, PA.

Why the Condenser Doesn't Condense

By E. L. Bragdon

THE word "condenser" is not new to many radio enthusiasts. They may not know what it means in radio terminology, but the chances are that they are affiliated with an industry that makes use of a piece of equipment by that name. The mechanic has seen a "condenser" in the power plant; the chemist has used it in distilling solutions; and the home-brew connoisseur has found it an essential unit in his outfit.

But the radio amateur is surprised to find that the "condenser" in his receiving set does not really condense. It has something to do with another familiar but misplaced word, "capacity," but so far as he can tell it certainly does not condense. Between the reason for this and the fact that the word "capacity" is bothersome, his logic gives the whole question up and he is content to follow directions,



Two water pails—one filled, the other empty—connected with a rubber tube. This is the most effective experiment of the condenser's way of operating. Drawn by E. L. Bragdon.

placing a condenser where mentioned without knowing or reasoning why. It is the intention of this article to simplify the subject of condensers and capacity, particularly as they relate to radio and the radiotelephone.

Suppose we place two pails of water on a table and connect the two receptacles by a tube which drops down several feet and then up again to the other pail. The tube being of rubber can be closed by pinching it with a clip. We will place the clip at the lowest point in the tube and then fill the left-hand pail with water.

Leaving the water experiment for the instant, we will secure a piece of glass a foot square and, on both sides, lay a sheet of copper or tin foil. We will connect a wire from each sheet of copper or tin foil to a terminal of a storage battery. Just as soon as the battery is connected, we will disconnect it and forget all about it.

We now have the following:

1.—Two pails connected, with one of the pails filled with water.

2.—A sheet of glass faced on both sides with metal.

The latter is a so-called electrical condenser while the former might also be called a hydraulic condenser. The glass plate has been connected with a source of electricity and, as a result, has obtained a certain amount of the electricity which it is holding. The pails have been connected with a water supply and then disconnected. The pail-system, as a whole, is retaining the water, even though the liquid is in but one pail. The reason for this I will presently explain.

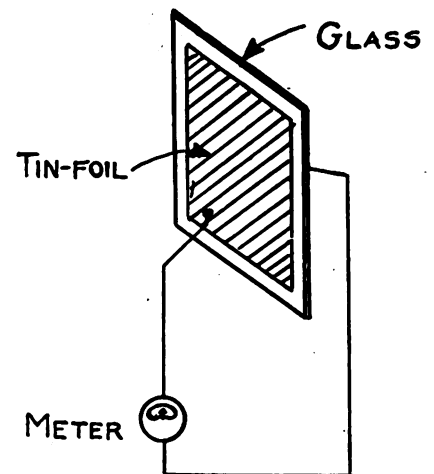
If the clip on the rubber between the two pails is removed, the water will rush down the tube, around the bend, and up into the other pail. But all the water will not reach the second pail, due to the friction of the water on the rubber tube. But all the water which does enter the second pail will no sooner get there than it starts back again toward its first home. This time, also, some of the water will fail to make the entire journey. This passing back and forth will continue time after time with the amount of water making the entire passage less and less, until, finally, the liquid comes to rest, half in each receptacle. When a liquid or a solid, passes back and forth over the same path, but in opposite directions, the action is called oscillation. No doubt, this term is recognized by radio amateurs who have heard it spoken and have read about it but who were not quite sure of its meaning. Let us leave the hydraulic experiment we have just witnessed, and turn to the glass plates with their electricity.

To make the experiment similar, we will connect the two metal plates on opposite sides of the glass, with a short wire. Not being able to see the flow of electricity, we will insert a meter in the wire. All the meter will do is to show by the movement of its needle when the electricity moves through the wire.

When the ends of the two wires are brought together, it will be noticed that the needle of the meter swings first in one direction to the very end of its path, then stops and quickly reverses almost to its opposite terminal. This swinging could not, in truth, be observed by any ordinary meter because it happens too fast, but by using a special device called an

oscillograph, the very path of the electric charge could be studied. The oscillograph shows that the two metal plates act just as the pail of water did. That is, they allowed the electric current to flow first in one direction and then in the other, gradually decreasing in intensity until the movement was dead. This action is another oscillation.

Most treatises of condensers supply the foregoing analogy last, leading up



A sheet of glass faced on both sides with metal. This comprises the so-called condenser. Drawn by E. L. Bragdon.

to it through simpler word pictures, but we have given it here first in order that the reader may understand thoroughly the *how* of the action of a condenser. After knowing *how* a condenser works it will be easier to study the *why* of it, which I now describe.

Everybody has studied the various hook-ups of radio receiving sets, and few indeed is the number who have never tried out a new arrangement of the units. All of these experimenters know that the principal places where a condenser is used are as follows:

In the antenna or ground wire; across the primary coil of the tuner; across the secondary coil of the tuner; and across the phones. At all of these places with the exception of the case of the condenser across the phones, the phones, the condenser is in the path of an alternating current—that is, a current which is traveling first in one direction, then stops, and retraces its path. Rather than take up each of the locations in turn, matters will be simplified if a representative layout is taken and thoroughly explained.

Radio Merchandising

Two Letters from Advertisers that Tell Their Own Stories

The SEBRING - OSEASOHN CO.

Incorporated
Sales Promotion

CENTURIAN BUILDING, (13th Floor), NEW YORK
Broadway, at 28th Street, Madison Square 6767

May 13, 1922.

F. S. CLARK, Manager,
Radio World, 1493 Broadway, City.
Dear Sir:

It may interest you to know that only recently, in the interests of our Radio accounts, we made a careful survey of all existing radio publications, as to their circulation, prestige, and value as advertising mediums.

As the result of our investigation, two out of every three of our radio clients have decided to give RADIO WORLD, in its weekly issues, more space than any other radio publication.

Copy for this increased space for our various accounts is in preparation and will be sent to you in time to meet closing dates.

Very truly yours,

THE SEBRING-OSEASOHN CO., Inc.

(Signed) W. H. SEBRING, Jr., President.

SOUTHERN CEDAR PRODUCTS CO.

Radio World Company,
New York, N. Y.

Kindly discontinue our "ad" until further notice as we must make further extensions in our equipment due to the tremendous increase in business resulting through the previous advertisements in your very valuable paper.—**EDWARD T. COLLINS, Organ Maintenance, Electric Blowers. Per. E. T. Collins.**

Radio Production

Increasing

EFFORTS on the part of electrical manufacturers to meet the demand for radio equipment, appear to promise early relief. Rather than "holding back" to increase the demand, these manufacturers claim they are doing their best to keep apace with it.

The General Electric Company expects to be able to produce between 8,000 and 10,000 complete receiving units within a very short time. A year ago, this company was producing about 10,000 detector and amplifying tubes a month, but as the demand

fell off last summer the rate was cut down to 5,000 per month, which held until November 1921, when broadcasting started. Then the demand began to soar, E. P. Edwards, manager of the radio department stated recently, until, by February 1922, it was estimated at 90,000 per month, at which time the company could only produce 60,000 per month. To-day, however, 100,000 tubes a month is the production figure, and a production of 200,000 a month is planned.

Trade Note

THE SAVOY MANUFACTURING COMPANY, 115 East 24 St., New York City, is now making deliveries of its "Savoy" Receiving Sets. The Savoy line is complete, consisting of five different receiving sets from a crystal detector set at a moderate price to a high-quality loud speaker to meet the demands of those desiring a more expensive equipment. Such a complete line will no doubt meet with favor among the dealers as it enables them to satisfy all pocketbooks.

Communicate With Them

Editor, **RADIO WORLD**: We are large producers of a high-grade super-sensitive radio galena. In fact, the galena we are producing is the best in the world, assaying from 84 to 86.30 per cent. metallic lead. If galena were absolutely pure, it would only run 86.6 per cent metallic lead, as it takes 13.40 per cent. sulphur to hold 86.6 per cent. galena together.

Bear us in mind should you have inquiries, with reference to radio galena. We do not mount crystals, but sell block radio galena as it comes from our mines.—**E. T. Swearingen, Century Building, Joplin, Mo.**

New Firms and Corporations

Great Eastern Radio Corporation. To broadcast, receive and relay electro or electro-magnetic communications. \$2,000,000. **T. L. Croteau, M. A. Bruce, C. H. Blaske, Wilmington, Del. (Corporation Trust Co. of America.)**

Super-Sensitive Radio Corporation. Manufacture and installation of radio equipment. \$500,000. **M. M. Lucey, M. B. Reese, L. S. Dorsey, Wilmington, Del. (Colonial Charter Co.)**

Atlas Radio Corporation. Maintain and operate commercial radio exchange systems. \$1,000,000. **Robert A. Van Voorhis, Jersey City. William E. Schiels, Jr., New Dorp, S. I., New York; Charles Graff, Jr., New York city. (Registrar and Transfer Co.)**

McLean Radio Supply Company, Corner Block Building, Hillsboro, Ill.

YOU CAN MAKE IT YOURSELF

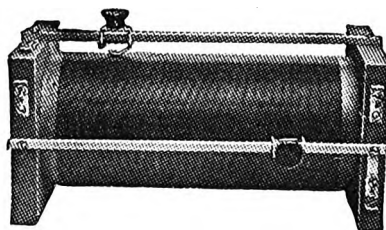
With

S. NEWMAN & CO.'s

plans showing how to make receivers, amplifiers, etc. See them at your dealer or at the **RADIO SHOW**. Dealers ask for our attractive proposition.

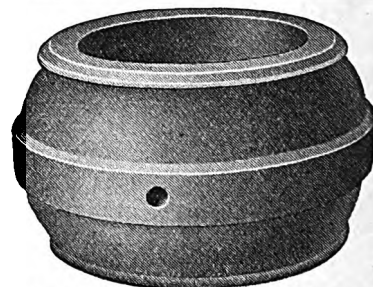
S. NEWMAN & CO.

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"Essex" Tuning Coils—Double Slide—Enameled wire—Good for loading coils.

LIST PRICE, \$3.00



"Essex" Polished Wood 3-inch Rotors

LIST PRICE, 50c

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NEWARK

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NEW JERSEY

(Continued from preceding page)

Ware Radio Corp., Manhattan, to issue 5,000 shares, par value \$100 each, and 7,500, no par value.

Super Sensitive Radio Corp., Wilmington, Del., equipment, \$500,000. (Colonial Charter Co.)

The Kuebler Radio Co., 32 Gibbs Bldg., Toledo, O.

Marshall Gerken Co., Toledo, O.

Service Radio Equipment, Box 340, Central Station, Toledo, O.

Anderson Motor Sales Co., Hubbard, O.

Lenox Electric Co., Manhattan, \$25,000;

W. Cohn, E. Gettinger. (Attorney, S. B.

Lilienstein, 280 Broadway, New York.)

Raymond Radio Corp., Manhattan, \$50,000; H. J. Sondheim, H. A. Cohn, C. Ziegler. (Attorneys, Alexander, Cohn & Sondheim, 51 Chambers St.)

The Stark Radio Co., Waynesburg, O. Julius Andrae & Sons Co., 117 Michigan St., Milwaukee, Wis.

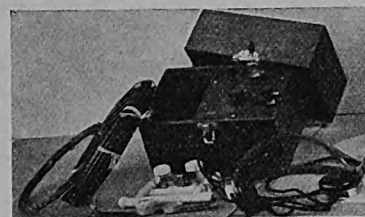
New Era Shop, Milwaukee, Wis.

H. S. Webster, radio apparatus, Lyndon Center, Vt. Does a mail-order business. Shipping charges paid on all orders in the United States.

American Phonophor Corp., Manhattan, telegraph and telephone supplies, \$100,000; S. Gilop, E. M. Foley, F. Loftus. (Attorney, F. J. Knorr, Albany.)

Hudson Radio Supply Co., E. H. Lorenson, general manager, 540 Warren St., Hudson, New York.

Triangle Phono Parts, 722 Atlantic Ave., Brooklyn, N. Y. Manufacturers of telephone head-sets and magnets.



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Complete With Double Head Phones **\$25.00**

Also Copper Antennae Lead Wire Ground Wire, Insulators and all the necessary parts that will enable you to hear everything within a range of from 25 to 50 miles.

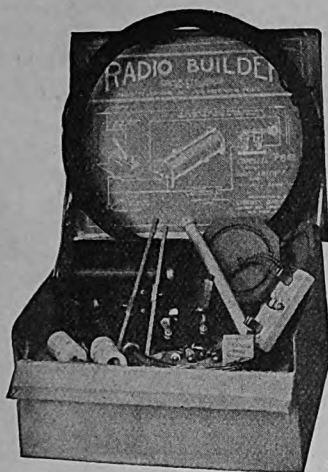
Also included is a radio text-book with complete instruction and valuable charts. Send for a Miracle Set today.

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Aerial, Ground Switch, Tuning Coil,
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The parts in this set are
"THE EQUAL OF THE BEST"

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In ordering be sure to specify make of Head-Phones and Phonograph you have. Immediate delivery anywhere. Satisfaction guaranteed. Price \$1.00 postpaid.

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SWEENEY RECEIVING SET—5 tube receiver (two stages of radio frequency amplification) detector and two stages of audio frequency amplification. Wave length 175 to 1000 meters. This is a wonderful set; price \$150. SEND 15c for illustrated instruction book, hook-up diagrams and complete catalog. Lowest prices and latest radio developments.

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UNION TRADING PLAZA, JARVIS CITY

RADIO WORLD

PUBLISHED EVERY WEDNESDAY (Dated SATURDAY OF SAME WEEK)
FROM PUBLICATION OFFICE, 1493 BROADWAY, NEW YORK, N. Y.—PHONE, BRYANT 4796
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FRED S. CLARK, Manager - - - - - 1493 Broadway, New York

ROBERT MACKAY

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FRED. CHAS. EHLERT

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A Simple Aerial Switch

One thing that always adds quite a little to the already high cost of wireless apparatus is the purchasing of a good aerial switch. The accompanying diagram shows a simple, home-made device. Its cost is negligible. In many places, it is possible to

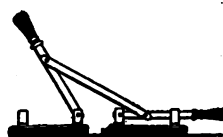


Fig 1

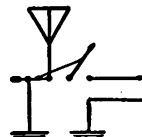


Fig 2

Figure 1.—Single-throw switches.

Figure 2.—How Switches Connect.

procure, discarded, single-pole, single-throw switches on fine slate bases for almost nothing. These are discarded in favor of large, centrally controlled switchboards.

To make a single-pole, double-throw switch of two single-pole, single-throw switches is shown in Figure 1. A hole is drilled in the center of each knife and a heavy piece of copper is fastened between them by means of a loose bolt and nut on each of its ends. The switches should be mounted on a board as indicated. The switch is connected as in Figure 2.

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G - W SLIDERS



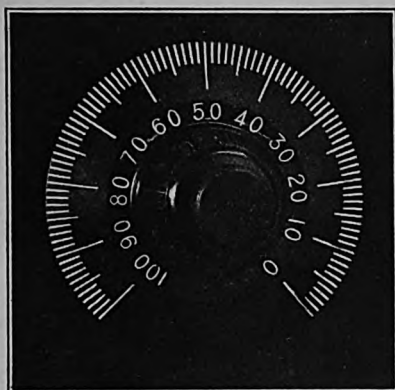
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3/16" 25c, 1/4" 30c

Ask for G-W Slider Rods
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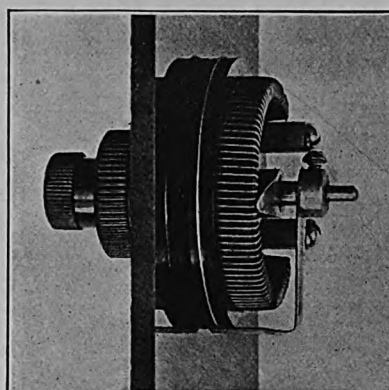


Panel Mt. with Dial
PRICE \$2.50

TECO.
RADIO CO.

P. O. BOX 3362
BOSTON, MASS.

Vernier Rheostat



Panel Mt. without Dial
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The Smallest!
REGULAR RHEOSTAT WITHOUT
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Can you maintain that critical adjustment on your V. T.?

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SPECIFICATIONS
DIAMETER OF RHEOSTAT 2".
RESISTANCE 6 OHMS.
BASES MADE OF REAL BAKELITE
SPECIAL ALLOY WIRE TO REDUCE LOSS IN HEAT.

With our **Vernier Rheostat** it is possible to obtain variations of one-one thousandth ($1/1000$) of an ampere.

Our attachment does not interfere with any previous method of panel or table mounting.

A recent development in the design of rheostats for use with receiving tubes. This instrument consists of a conventional form of rheostat, with the addition of a finely adjustable Vernier attachment. The latter consists of one turn of resistance wire wound about the bakelite form and continuously variable by means of an extra contact. This contact is operated by means of a small knob, the shaft of which passes through the hollow shaft of the larger control knob, which regulates the resistance by turns. The elements of the rheostat are so built that, with one ampere flowing in the circuit, one complete turn of the Vernier control only changes that current one-tenth of an ampere. With such a small change, it is easy to obtain a variation of as small as one milli-ampere.

The **VERNIER RHEOSTAT** eliminates the necessity of a B-battery potentiometer and the extra space it requires. After all, it is not a fine control of either plate or filament sources that we require for our detectors, but a finely adjustable balance of the two, which will allow us to operate on the best point of the filament-current, plate-voltage characteristic to obtain maximum efficiency in detection. This consideration is quite necessary in using the later types of vacuum tubes which are very critical in operation.

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The rate for this RADIO WORLD QUICK ACTION CLASSIFIED AD. DEPT. is 5c. per word (minimum of 10 words, including address), 10% discount for 4 consecutive insertions, 15% for 13 consecutive insertions (3 months). Changes will be made in standing classified ads., if copy is received at this office before 4 P. M. on any second Tuesday preceding date of publication. RADIO WORLD CO., 1493 Broadway, New York City. (Phone, Bryant 4796.)

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WANTED—Radio concern to undertake manufacture, and sale of newly invented, Directional Indoor Aerial. Not a loop, better than loops. Write, Frederick Ghio, P. O. Box 89, Bristol, Conn.

RADIO FANS—Send for our catalog of Radio, Electrical and Mechanical books, also includes radio outfits and Amplifying transformers. Prices Reasonable. A. C. Urie & Co., 333 W. Manhattan Blvd., Toledo, Ohio.

SAVE MONEY—Supersensitive galena quarter pound, 55c., half pound, \$1.00. Big sample, 30c. Streiff, 73 Flatbush Ave., Brooklyn, N. Y.

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INSULATORS FOR AERIALS—Support your antennae properly. Prevent current leaks. Our antennae insulators are of hard glazed porcelain, the ideal insulating material. Made to withstand a pull of 2,200 pounds. Light, strong, inexpensive. Write for samples and full information. THE FEDERAL PORCELAIN CO., Carey, Ohio.

VARIABLE CONDENSERS, 23 plate, .0005 M. F. Panel type, accurately made and adjusted, big value, \$8.00, postpaid. Zeunert Co., 1752 N. Park Ave., Chicago, Ill.

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AMATEURS—Build your own sets. You can assemble our outfits to look like factory-built instruments. Audion Receiver complete, including cabinet, drilled panel, switches, condenser, dial, coil parts, V. T. socket, rheostat, phones, antenna, batteries, tube, blueprints instructions and tools. Nothing else to buy. Complete price unassembled, \$55.00. Without batteries, tube, antenna and phones, \$27.50. Crystal sets unassembled, \$10.00 and \$20.00. Stamp for folder No. 1. Edward T. Collins, 8522 101st St., Richmond Hill, L. I., N. Y.

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Type R-3. Immediate shipment from stock. Aeriolian Co., Bethlehem, Pennsylvania.

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Wanted.—A few Western Electric VT-1's, VT-2's and head sets for use in our laboratory. Must be perfect. State quantity and lowest price. Reading Radio Shop, Box 6, Reading, Mass.

Crystal Set That Gets Radio Concerts. Build it right boys. Plans and full instructions for building at low cost, high grade fine adjustable Crystal Receiving Set, fifty cents postpaid. Dept. R. D. Shaw Mfg. Co., Galesburg, Kans.

High Grade Antenna Wire. Best quality 7 strand No. 22, tinned copper, non-corrosive antenna wire. Only 1c. per foot. The Kehler Radio Laboratories, Dept. W., Abilene, Kans.

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Manufacturers wanted for large production and home-workers on smaller scale for Metal Toys and Novelties, Toy Soldiers, Cannons, Cowboys, Indians, Buffalo Bills, Wild Animals, Whistles, Bird Whistles, Race-horses, Prize-fighters, Wag-tail Pups, Barking-dogs, and hundreds of other articles. Hundreds and thousands made complete per hour. No experience or other tools needed. Bronze casting forms complete outfit for \$5.00 up. We buy these goods all year, paying fixed prices. Contract orders placed with manufacturers. Exceptionally high prices paid for painted goods. An enormous business for this year offers industrious men an excellent opportunity to enter this field. Write us only if you mean real business. Catalog and information free. Metal Cast Products Co., 1696 Boston Road, New York.

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Communicate with us regarding Detectors, Binding Posts and other radio parts.

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How and why radio works and essential information to get results.
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708 CANADIAN PACIFIC BUILDING

Latest broadcasting map 15c. That is, a complete broadcasting map appeared in last week's issue of Radio World, No. 8, dated May 20. Mailed on receipt of 15c. Radio World Company, 1493 Broadway, N. Y. C.

Why Waves Cling to Earth

ELECTRIFIED dust thrown off by the sun forms an atmospheric envelope about the earth to a depth of about a hundred miles. This envelope is what prevents wireless waves from escaping into infinite space, declares Professor J. A. Fleming, University College, London, one of the eminent wireless workers of the world.

The screen made by the dust, says Professor Fleming, acts as a sort of wireless speaking tube and enables waves used for long distance work—which are about ten miles in length—to travel 6,000 and 12,000 miles.

If it were not for that screen, the wireless energy thrown out by the big sending towers would not cling to the earth, but would pass away and be lost.

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In diameters from 2½" to 6"
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Broadcast Bill's Radiolays

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WITH folks the other eve'nun I commenced to listen in as usual when the chores were done, 'cause that's when they begin, and just when I had got set down my wife comes pesterin' me "The hogs is out, now hurry 'fore it's dark so you can see just where the fence is busted. Better drive 'em in the shed," and after sayin' this she jerked them earmuffs off my head. You know that kinda made me mad but hogs is hogs these days, I didn't stop to argue—after all it never pays. I chased 'em in the shed and then I closed the doors up tight and dern their measly pictures that's right where they stayed all night. I peaked in at the winder when I got back to the house an' caught my wife a sittin' there as quiet as a mouse, a listenin' on my



wireless set, a smile on her face. It didn't worry her a bit that she was in my place. She seemed to be so interested I wondered what was doin'. I had a hunch 'twas somethin' that would start more trouble brewin'. And sure enough my guess was right, some woman was explainin' how women folks had ought to dress. Here's where I start complainin'. You never hear 'em telling of the latest style in pants, or what us men should doll up in when we go to a dance. But then I guess that it's all right, my wife's just like the rest, and when she goes to town she wants to be dressed in her best. Now since they broad-cast fashions I can feel it in me bones. I've got to sell a hog and get another pair of phones.

S-C LOUD SPEAKER HORN



Delivered at any door in U. S. for

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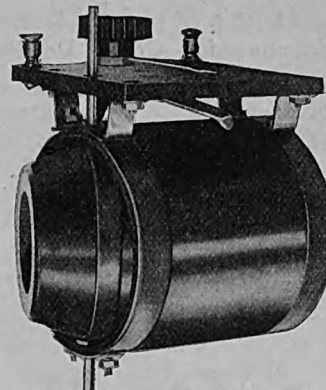
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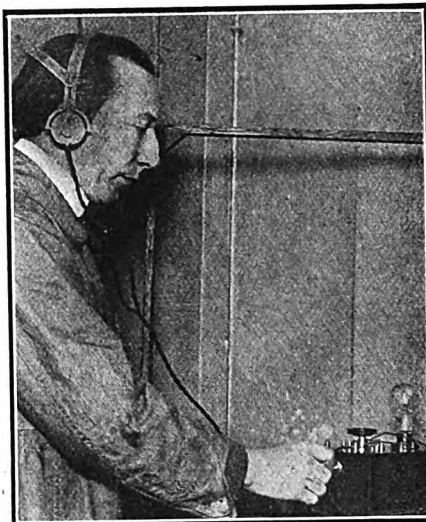
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We May Receive by Radio Across Atlantic Ocean



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mahogany finish with necessary hardware, \$1.75
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Send 5c for bulletin Radio and Electrical Supplies.
Send 40c for instructions how to construct your own parts with diagrams of connections.
Parcel Post prepaid in U. S. 24 hour shipment
NEWCO RADIO & ELECTRICAL SUPPLY CO.
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Silvertone Talkers, \$10.00

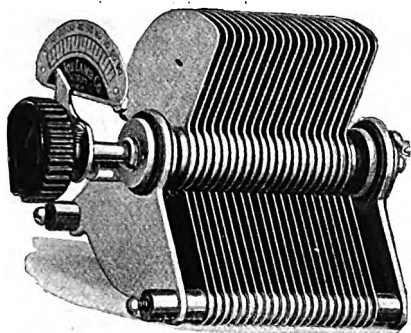
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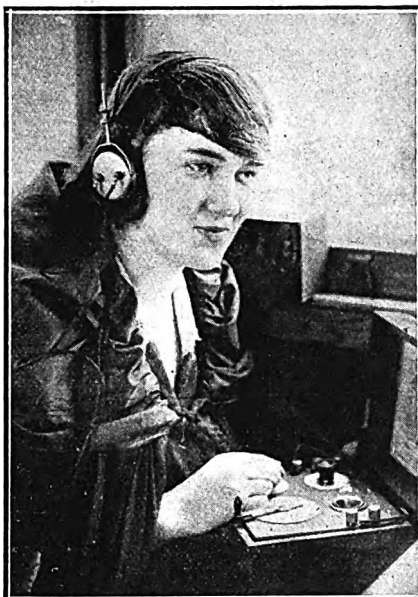
26 Cortlandt St., New York.

Radio Now Heard on Buses in New York City

THE Fifth Avenue Coach Company has broadcasted this interesting information:

Music was received on one of its buses while the vehicle was traveling at its top speed. There was no antenna reaching upward or a ground wire trailing behind to trip up pedestrians. The aerial was the metal rail of the bus and by attaching the ground wire of the radio set to the rail of the bus stairway, a counterpoise grounding was accomplished.

The bus used for the test is a new one known as "Peter's Paradise," because it is a double-decker with a roof over the upper deck. Joseph Conniff, mechanical fore-



(C. P. & A. Photo)

It is now possible to pick up a radio concert while riding either in or on top of a Fifth Avenue bus, in New York. The photograph shows Miss May Conklin enjoying a radio concert on the upper deck of a bus as it glides along Riverside Drive

man of the company's garage, No. 4, and William Zimmerman were the men who conducted the experiment. They used a Westinghouse senior set, audion detector-bulb, and head pieces.

Zimmerman held the set in his lap and enjoyed the noon broadcasting from WJZ. Conniff toolled the bus along Riverside Drive at a speed that, at times, exceeded twenty miles an hour. There was no interference either from the trees that border the drive or the factory noises that waft across the Hudson River from the Jersey side. Even the occasional bumping of the bus whenever it hit the customary "Thank-you-ma'am," brought no interruption.

The company intends to make further experiments in the hope of eventually making radio reception a regular feature of a bus ride.

If you were not able to get the first eight issues of RADIO WORLD, your news-dealer can probably get the copies through his wholesaler, or copies will be mailed from this office direct, at 15 cents per copy. RADIO WORLD CO., 1493 Broadway, New York, N. Y. (Adv.)

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Radio brings it
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These are small compact instruments of the lattice type with no unnecessary frame work. Maximum efficiency, sharp tuning. Ideal for portable sets and for those who build their own because of easy accessibility.

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Little Chief Bear Hears Big Radio



(c. Underwood & Underwood)

Little Chief Bear, son of Big Chief Bear, who was killed in Custer's Last Stand, had his first experience with radio at the National Hotel and Restaurant Show in Chicago. The chief donned the head piece while music was coming over the ether and insisted on keeping time on his tom-tom.

We'd All Listen In

There is something appealing to the idea of a newspaper sending out radio entertainment, says the New York "World." Every newspaper office has a great many whistlers, chanters, and balladists who could be rushed to the broadcasting chamber whenever the tunes bubble to their lips. "Hire a hall!" would cease to be an imprecation heard about newspaper offices.

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With all standard sets, including the \$25.00 sets FEDERAL JR, AERIOLA JR, PINK-A-TONE and AEROPHONE.

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**Viking Vernier
Condenser**
3 Plates
Red fibre top and bottom.
Insures finer tuning with a
"Variable," or can be used
as a Variable Phone or
Grid Condenser,
Price \$1.50



**Ideal Variable
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A full capacity "Variable" of genuine merit
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Bakelite Plates top
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11 Plate 3.00



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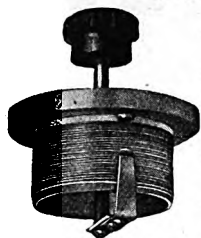
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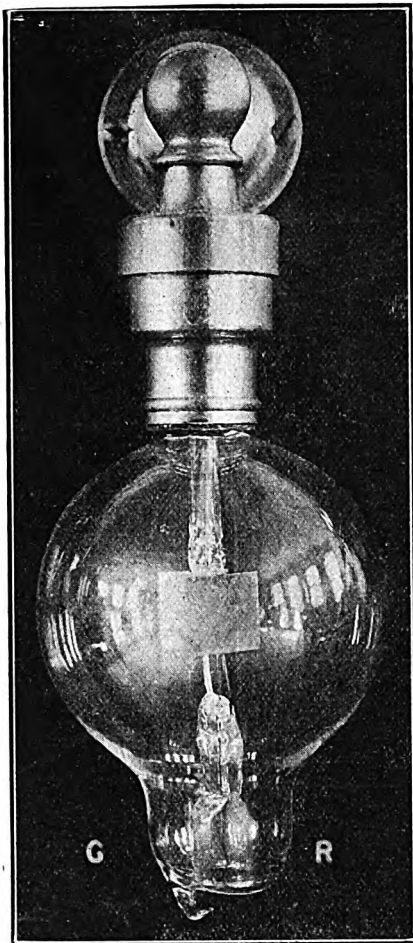
**One of Dr. Lee De Forest's
First Vacuum Tubes**

Photo by Paul Thompson.

Lee De Forest's earlier type audion bulb. The photograph shows it in full size. It contains a double plate, grid, and filament. This tube was one of the first types used in which the lamp was screwed into the socket. This tube has been vastly improved on by the new socket bulb. It was an advanced affair some ten years ago.

**Danced in New York to
Music Played in Chicago**

MUSIC by radio from Chicago and Newark was the feature of the dance given by the Advertising Men's Post, No. 209, American Legion, at the Pennsylvania Hotel, New York, on Friday evening, May 19. This unique innovation added much to the attractiveness and enjoyment of the affair. The dance was largely attended, the list of patronesses included the names of Mrs. Herbert S. Houston, Mrs. George Hopkins, Mrs. Charles W. Hoyt, Mrs. Frank Presbrey, Mrs. Frank Fehlman, Mrs. C. W. Fuller, Mrs. John Budd, Mrs. Wallace C. Richardson, Mrs. Harvey C. Wood, Mrs. S. E. Leith, Mrs. Dan Carroll, Mrs. William M. Hewitt, Mrs. Harry Tipper, Mrs. E. J. Loranger, Mrs. John Lee Mahin, Mrs. Oliver B. Merrill, Mrs. Jesse H. Neal, Mrs. Mortimer D. Bryant, Mrs. H. H. Charles, Mrs. George Ethridge, Mrs. William H. Johns, Mrs. Dora Davies.

Tickets were \$2.50 per couple. The proceeds over and above a small amount needed for the Post administrative fund, were donated to the fund being raised for the Veterans' Adirondack Mountain Camp.

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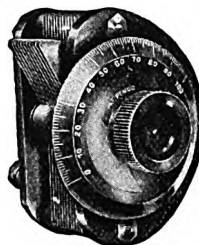
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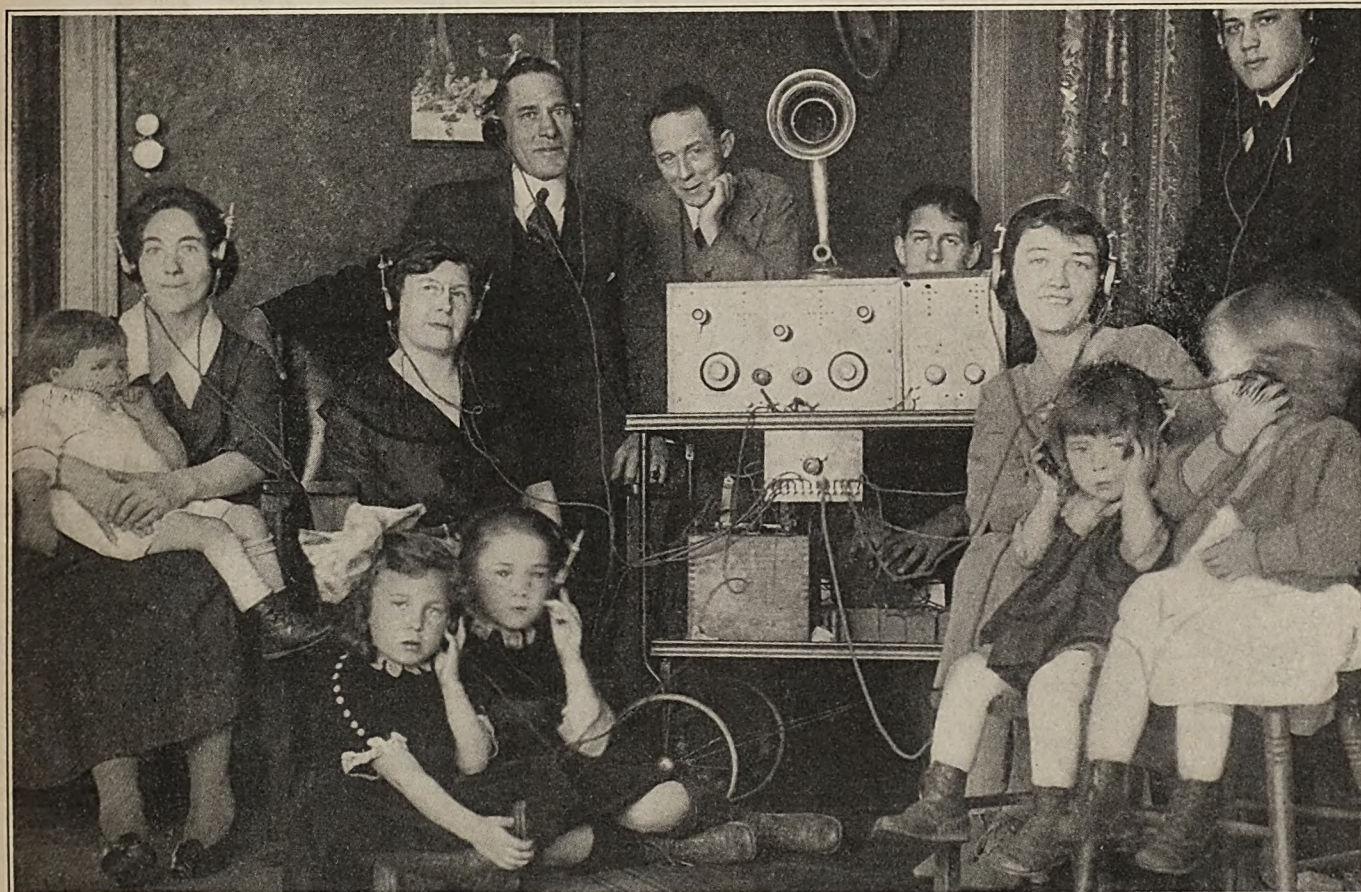
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RADIO WORLD

Entered as second-class matter, March 28, 1922, at the post office at New York, New York, under the act of March 3, 1879

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The Modern Home. Everyone Listens In.



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A radio family—and every member smiling and happy. Left to right: Alfred Rinehart, Jr., (rear) Mennie Matoth; Phyllis and Mrs. Avery Lord of Elizabeth, N. J., John A. Matoth, President of the Matoth-Perry Automobile Body Co., of Rahway; Alfred Rinehart, Sr., of Elizabeth, father of the young inventor; Mrs. John A. Matoth; Helen and Josephine Matoth (at her feet) and a maid holding Fred Matoth. John A. Matoth is the inventor of the radio tea wagon, equipped with a radio set with three stages of amplification. Alfred Rinehart, Jr., is the inventor of the radio ring.

Design for an Amateur's Receiving Set—See page 13

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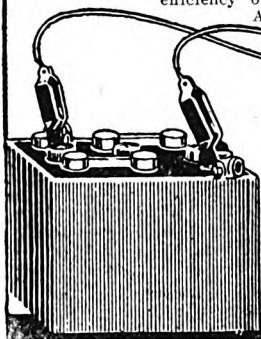
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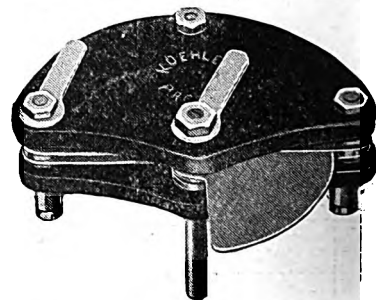
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A WEEKLY JOURNAL, PUBLISHED EVERY WEDNESDAY AND DATED SATURDAY BY RADIO WORLD COMPANY, FROM PUBLICATION OFFICE, 1493 BROADWAY, NEW YORK, N. Y.

Vol. 1. No. 10.

June 3, 1922

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"Honest Commerce Is Nation's Need" President Harding Radios World

President Harding delivered, by radio, the most important address he has made since he took office, before the Chamber of Commerce of the United States, last week. He pleaded for the building up of the merchant marine and for the needs of honest commerce. It was a speech that gave assurance to all business all over the world. The President used a sound detector to catch his words which were broadcast by radio through the powerful United States Navy Radio station at Washington.



(P. & A. Photo)

Rectifying Devices for Charging Batteries

WHEN a motor generator is the power source, the voltage may be controlled by means of a rheostat in the machine itself which causes the voltage generated to be lower than normal. This latter method requires the services of a skilled electrician or at least a knowledge of the design of the generator and for that reason will not be discussed here.

During the discussion of methods of rectifying alternating currents to the necessary direct-current one-type was purposely omitted until this time because of a feeling that few ama-

teurs would wish to bother with it. This is the aluminum cell; or, as it is better known, the electrolytic rectifier.

This rectifying device consists of a rubber or glass jar into which a strip of aluminum and a strip of lead are placed. The jar is then filled two-thirds of the distance to the top with a saturated solution of borax. When an alternating current circuit is connected to this rectifier with the latter in series with one side of the circuit direct current will be produced at the other terminal. The action is similar to that of the vacuum tube rectifier mentioned in an earlier installment of

this series. The current in passing through from the lead plate to the negative aluminum plate forms a thin film of oxide on the latter plate which permits the current to pass in one direction only. Like the vacuum-tube rectifier, the direct current is not unvarying direct-current but is pulsating direct current. It is suitable, however, for battery charging. But the noise from this type of device and the bother of frequently renewing the chemicals makes it a rectifier seldom used, especially if other means are available. This is an economical device for rectification.

TTEFA
+

The Cost of a Single-Circuit Receiver

By Howell W. Miller

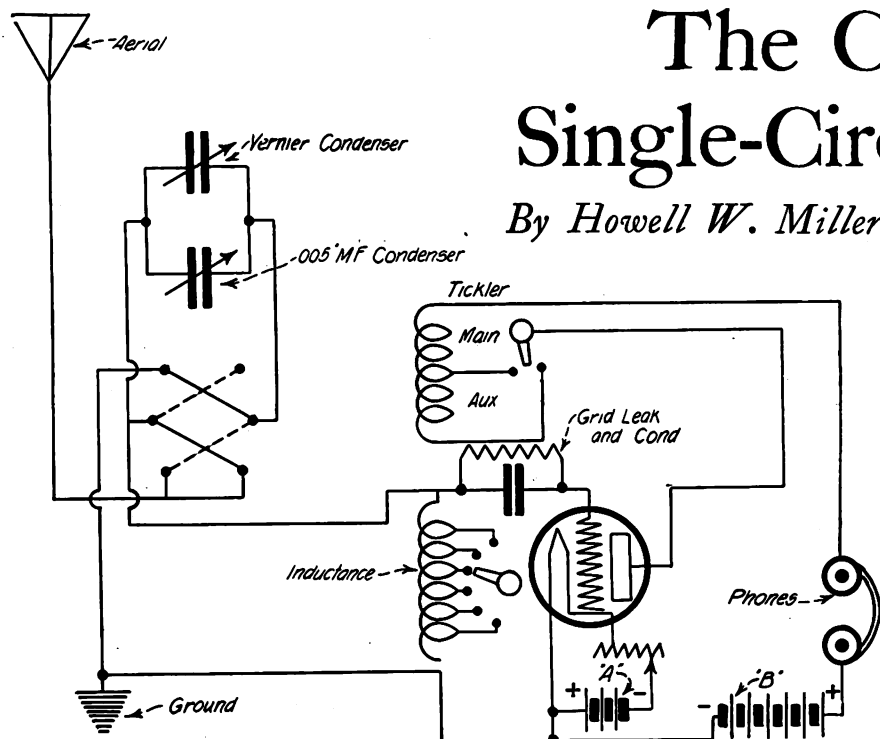


Diagram of the circuit of a simple receiver which tunes to 1,700 meters. The main inductance-coil switch-knob, which shows no connection, must be soldered to the positive pole of the A battery. This completes the regenerative receiver. Suggested by H. W. Miller. Drawn by S. Newman.

AS soon as a beginner tires of the inefficient crystal set, and wishes to incorporate a vacuum-tube detector, the best outfit to construct is the single-circuit regenerative receiver. The ease and simplicity with which signals and speech may be tuned in more than makes up for the selectivity this type of receiver is supposed to lack.

The outfit I describe herewith I constructed. It is giving excellent results both for the reception of spark and c.w. The design is simple yet remarkably efficient.

The panel is constructed of bakelite or wood, and the dimensions are 7x12x $\frac{3}{8}$ inches. To the right of the panel is the detector. The circuit used is shown in Figure 1. The series-parallel switch places the condenser either in series or in shunt with the inductance. When in shunt, the set is able to tune up to 1,700 meters, which makes it possible to receive radiophone w.v.p. Bedloe's Island, New York.

The inductance is constructed as follows: On a cardboard tube $3\frac{3}{4}$ inches in diameter and 4 inches in length, start winding No. 24 B and S., DCC wire. At the end of every tenth turn form a loop for connection to switch points of panel. This winding is kept up until 60 turns are wound. The unused portion of this tube is for the auxiliary tickler.

The main tickler is wound on a cardboard tube $1\frac{1}{2}$ inches in length

and 3 inches in diameter. This coil rotates within the inductance. The winding is started about $\frac{3}{4}$ inch from end of the tube and continued until 18 turns are wound. Then a spacing about $\frac{3}{8}$ inch is left for the rod with which the coil is rotated. Then 18 turns are wound about the other half.

Now, directly beneath the inductance, on the unused part of the tube, the auxiliary tickler is wound. The tickler permits the set to oscillate on the higher wave-lengths. This winding is 20 turns of 24 DCC wire. A two-point switch on the top of the panel allows the use of the main tickler alone or with auxiliary tickler.

A 23-plate variable condenser is placed in series or parallel with the inductance by means of the series-parallel switch. In shunt with the 23-plate variable condenser is the vernier condenser, which is the secret of sharp-tuning with this set.

This vernier is home-made and consists of movable and 2 stationary plates. The stationary plates are $3\frac{1}{2}$ inches in length and $1\frac{1}{2}$ inches wide. They are cut from zinc or aluminum. The rotary plate is semi-circular in shape and has a radius of 1 inch. This condenser allows an overlapping when used with the 25-plate condenser. The stationary plates are separated $\frac{3}{8}$ inch.

The detector is to the right of the panel. Five holes are drilled for observation of the V-T tube. The tube socket is raised $1\frac{1}{4}$ inches above base of cabinet, which allows the observation holes to be centrally located.

The wiring is of No. 18, bell-wire.

The cabinet may be made of any kind of suitable wood, $\frac{3}{8}$ in. in thickness. The dimensions are as follows: Top (beveled edges) and bottom (6 base) $6\frac{1}{4}$ inches x $12\frac{3}{4}$ inches; sides (2) are $6\frac{1}{4}$ inches by $7\frac{3}{4}$ inches and the panel and rear is 7 inches x 12 inches. The top is hinged to the front panel in order to remove the V. T. when necessary.

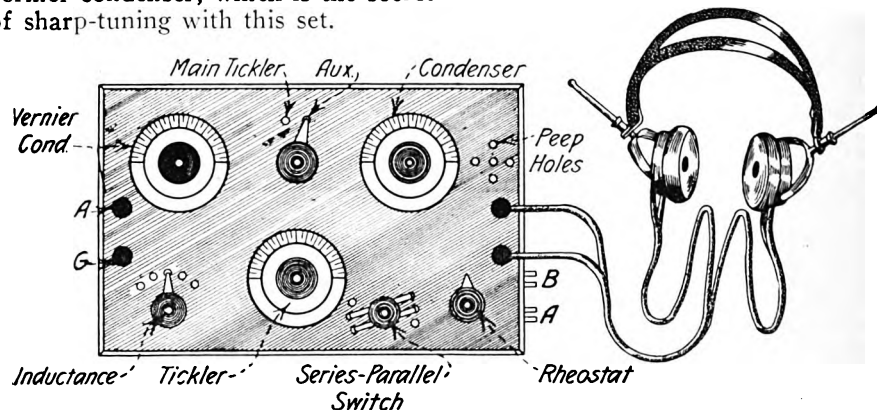
Using this outfit in New York City, I am able to hear Pittsburgh, (KDKA.)

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This is exclusive of the cost of A and B batteries and phones.



View of front panel of regenerative receiver showing the layout of the equipment. Suggested by H. W. Miller. Drawn by S. Newman.

Radio World's Hall of Fame



(c. Harris & Ewing, Washington, D. C. From Paul Thompson, N. Y.)

JOHN HAYS HAMMOND, Jr.

Mr. Hammond is one of the leading radio experts and experimentors of the United States. From his laboratory in Gloucester, Mass., it is reported that he has perfected a comparatively simple device to prevent any station from receiving messages except those for which it is intended. The same wave can be made to carry several messages at the same time, and, it is claimed further, both voice and code may be transmitted. The new apparatus will permit a far greater number of stations to communicate over a limited number of wave lengths. Static is diminished to the extent that the system may be operated under conditions where the standard radio equipment would not receive. Mr. Hammond states that he has been at work on this important problem for the past fourteen years. He promises actual secrecy in radio reception to such extent that it will be practically impossible, under ordinary conditions, for any other than the proper receiving station to hear anything but a jumble.

The Radio Primer

A. B. C. for the Beginner Who Must Have the Facts Put Plainly and Tersely, and all Terms Fully Explained

The Beginner's Catechism

By Eaward Linwood

WHAT is the general constructional features of a B battery?

The B battery is merely a collection of dry cells of the same type used in the common flash-light. There is nothing revolutionary about their make-up. Ordinary dry cells of the design used to operate door bells may be utilized for this purpose. An excellent article on the details of these batteries was contained in the RADIO WORLD No. 8, dated May 20.

* * *

Why must the B battery be 22½ volts?

Because the usual detector-tube gives its best results when the voltage on the plate of the tube does not exceed that figure. The number of electrons flowing between filament and plate depends on the plate potential up to a certain point. With tubes using 6 volts and 1 ampere on the filament, the maximum electron flow is found to be possible when the voltage on the plate is not more than 22½ volts will not increase the electron flow as the plate then is absorbing all that are being produced by the flaming hot filament. Amplifier tubes require a higher plate-voltage.

* * *

Why is it necessary that the B battery while the filament battery is a storage battery?

This question is worded in reverse order. There is no reason why the plate battery should be dry. It may as well be a storage battery except that the increased cost of the latter type does not recommend it to the amateur. But the filament battery—for reasons carefully explained many times in these columns—must be a storage battery for economy's sake. Whereas the amount of current taken by the plate is reckoned in thousandths of amperes, that of the filament is approximately 1 ampere, or a thousand times as great.

How long should a B battery last?

Like an incandescent lamp, or a vacuum tube, its life is indeterminate. The B battery is supposed to give 1,000 hours actual service. Some of them do. Many of them do not. Perhaps the reported average is nearer 500 hours. This decrease may be due to the battery itself; that is, the hastening of the chemical action within the case, or to misuse by the owner. At any rate, a good grade of B battery will give its purchasing cost in reliable service before signs indicate its weakening.

* * *

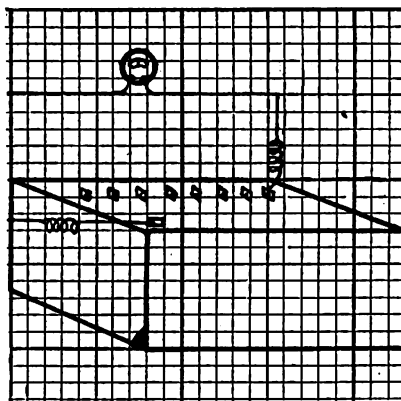
What is the sign of a weakening B battery?

If, after opening up the receiving set for the evening, the signals start strong and firm and then gradually decrease in intensity, the trouble is probably, but not surely, due to the B battery. Any dry battery recuperates considerably when not in use; but after commencing to draw current from it, the voltage will drop rapidly because it lacks the capacity.

* * *

How can B batteries be tested?

A fairly satisfactory test may be made by means of a battery volt-meter across the terminals. Don't make the test when the battery has been resting



One method of testing B Batteries for voltage, using a low reading volt meter.
Drawn by E. L. Bragdon.

but only after being in use for an hour or so. Try the battery on its individual terminals. If the readings are much below the markings for those terminals, discard the battery and get a new one.

* * *

Is it advisable to attempt to rejuvenate B batteries by opening the case and soaking in vinegar or a sal ammoniac solution?

No. This stunt may work well enough with annunciator or door-bell batteries where it is not essential that their operation be "up to scratch;" but such rejuvenations around radio equipment is out of place.

* * *

Can any of the "wet" batteries be used to supply the plate voltage?

Yes. Any of the common wet batteries will give good results although their bulky proportions work against their general use. The voltage of wet batteries seldom rises above 1.2 per cell, hence you would need twenty of them in order to produce the 22½ volts on the plate.

* * *

Is a rheostat advisable for the B battery?

A rheostat in the plate circuit is a refinement, not a necessity. Most radio batteries—all the good ones—are supplied with taps from which any potential from 12 or 14 to 22½ can be selected. The tubes used for detectors do not ordinarily require an adjustment of plate voltage closer than that furnished by these taps. A plate rheostat, however, does no harm and may be added if desired.

* * *

It is advisable to wind one's own rheostats for B and A batteries?

No; unless the maker is expert in the line. No extraordinary skill is required to design and wind a rheostat for this work, it is true; but the cost of the equipment is so slight that by the time a good home-made product is ready for use the cost in labor and material will exceed that of the professional article.

* * *

Can a loud-speaking device be used on one vacuum tube?

It cannot be done. Before a loud speaker can be attached to the receiving set the signals must first be amplified to a considerable degree. There have been instances where the receiving station was located in the same city close to the broadcasting station and where the words and music came in so strong with a single tube regenerative set that the phones could not be held to the ears without discomfort. Under these conditions a loud speaker would be possible.

Code Messages Now Circle Globe

By Carl Hawes Butman

WASHINGTON. — "Within a few months, probably, it will be possible for a representative of the U. S. Government to talk to anyone in the world, or to all people at one time, on the new Naval radiophone transmitting set at NAA, the Arlington Station on the Potomac River." This remark was made by a high-ranking officer of the Navy Department, recently, who added that the Navy could now send code messages practically around the world, by the use of relays.

Speaking into any ordinary telephone in Washington connected with the Arlington Broadcasting Station, an official could talk to a Pacific Coast station, which would automatically relay the message within a sixtieth of a second to Pearl Harbor, thence to Guam and Cavite, where the message would arrive in one quarter of a second after it left Washington. The further routing he did not explain, but is known that other big stations are in prospect overseas.

The simultaneous broadcasting of a single spoken message from two stations on different wave-lengths was successfully conducted for the first time by the Navy on Saturday, May 20, for the purpose of making sure

that plans for broadcasting the headquarters dedication program of the National Woman's Party were satisfactory. Through the cooperation of the American Telephone and Telegraph Company, direct wires were strung from the Woman's Party Headquarters to the Naval Air Station at Anacostia, D. C., and the Naval Radio Station at Arlington, Va. Test messages spoken at the headquarters were transmitted by wire to these stations and put on the radio-broadcasting circuits. At Anacostia, NOF, a 412-meter wave was used, with about 13 amperes radiation; at Arlington, NAA, on a 2,650 meter wave, with 40 amperes.

The system worked perfectly, serving two classes of receiving stations at once, the 412-meter wave furnishing many amateur stations within from 400 to 700 miles, while the long wave served stations equipped with larger receiving sets, between 800 and 1,500 miles distant.

The actual broadcasting of the speeches, Sunday afternoon, however, was prohibited by Naval officials Saturday, on the ground that the meeting was of a political nature such as was previously ruled against by Edwin Denby, Secretary of the Navy.

The experiments in simultaneous broadcasting from two stations on different wave-lengths have been so successful that, it is believed, several stations, not too greatly separated, will soon be able to broadcast a single phone message on a number of different wave-lengths at one time, reaching receiving stations nearby and at great distances, even crossing oceans to powerful foreign stations.

With the perfection of this system and the necessary apparatus, President Harding, for example, could address practically the whole world, or at least all the people provided with suitable receiving apparatus who understand English. This would furnish an excellent method of issuing official verbal statements of serious import or bearing on the policies of the country. The broadcasting of a direct personal message, such as President Wilson made to Congress on the day the United States declared war, would have made America's position immediately known to the world. It is unlikely that any international broadcasts will be sent out by the Naval stations except experimentally or in the event of a declaration of vital national importance. The station is for official use only.

Radio Terms at a Glance

LINE OF FORCE.—Those invisible streams of magnetism that surround a coil of wire such as a tuning coil, loose coupler, or variocoupler. It is these lines of force that transfer the electrical energy from the primary coil of a tuning device to the secondary coil. That these lines actually exist can be easily proved by laying a piece of magnetized iron under a sheet of paper on which fine iron filings have been strewn. The filings will assume positions along curved lines which lead from one end of the magnetized strip to the other. Although there is no metal around tuning coils except the copper wire (which is non-magnetic) these lines of force exist. They pass out of the individual turns of the coil down through the center and around to the other side.

NON-MAGNETIC. — The term applied to some common metals which are not attracted or repulsed by a

magnet. Copper brass carbon and gold are examples of non-magnetic metals.

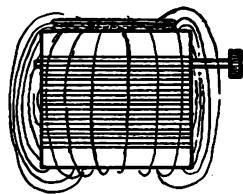


Figure 1. How lines of force act in a radio loose coupler.

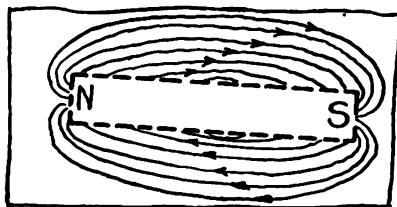


Figure 2. How the lines of force would affect iron filings if the metal particles were spread on a sheet of paper over a bar-magnet.

MEGOHM (meg-ome). — Meaning one million ohms. This term is used when referring to those devices

and parts which have a tremendously high resistance to an electric current. Correctly speaking, there are no perfect insulators. All insulators permit the passage of some current though it be infinitesimally small. A grid lead, used with vacuum tubes, is a conductor of extremely high resistance, usually of 2 megohms, or two million ohms.

MICROHM (my-crome).—Meaning one-millionth of an ohm. This term is used when referring to a conductor which allows the passage of an electric current with exceedingly small resistance.

POLARIZATION (pole-r-ee-zay-shun).—A word used to describe the result of a chemical action within dry cells which results in the destruction of the cell as a current generator. Polarization usually takes the form of bubbles of gas which surround one pole of the battery preventing the active chemicals from uniting with the metal of that pole to produce an electric current.

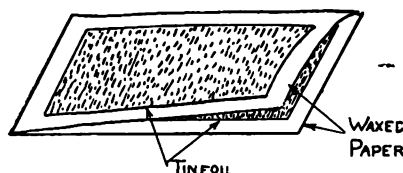
How to Compute and Build a Fixed Condenser

By E. L. Bragdon

THE fixed condenser can never succeed the variable condenser for most applications in radio work, because of the wide flexibility of the latter which the stationary or fixed condenser lacks. But many amateurs building their own sets from odds and ends find the variable condenser to be the most expensive piece of equipment in the assembly. In many instances, they would be willing to sacrifice a bit of sensitiveness if the cost could be reduced. One method of doing this is by means of a home-made fixed condenser arranged in a small cabinet with taps brought out to a point switch to vary the capacity in the circuit. A second switch is then arranged so that additional capacity may be placed in parallel with the other thus providing a sort of step-vernier adjustment.

In building condensers, the first consideration is in regard to materials. For radio telephone receiving circuits, tin foil for the conducting plates and waxed paper for the insulating medium are as satisfactory as any and have the advantage of being readily purchased and easily worked.

Although waxed paper can be purchased at most novelty stores the amateur is not certain that the insulation will be perfect. This paper is liable to have multitudes of minute pinholes dotting its surface, providing



How a condenser is built up of alternate sheets of tin foil and waxed paper. Drawn by E. L. Bragdon.

by-passes for the electric charges and reducing, by a great extent, the condenser's capacity. By far the best procedure is to secure a good quality of bond paper—only a few sheets of regulation commercial letter size (8½ by 11 inches) are required—and add the paraffine coatings at home. A small block of paraffine may be purchased at any department store and at many drug stores. Shave the wax into small fragments and place them in a steam kettle. The wax will melt easily. After the liquid paraffine is

boiling freely, drop in the sheets of paper, cut up into smaller pieces if this is necessary because of the size of the kettle at hand. Allow the paper to remain in the wax for fifteen minutes, making sure that all air bubbles escape from the pores of the paper by frequently jabbing the sheets with a flat implement. At the end of the time, remove the paper from the paraffine and hang by the corners to dry.

A good grade of bond paper treated in this manner has been found to have a capacity quality denoted by the technical term and notation of "dielectric constant equal to approximately 3 inches." This is a fact to remember since the term and the quantity will appear frequently during the course of this article.

Scientists have worked out a formula for the construction of condensers which contains but few substitutions. It is as follows:

$$\text{Capacity} = .0885 \times \frac{KS}{1,000,000 D}$$

The capacity in this formula is given in microfarads, usually abbreviated to "mfd."

K is the *dielectric constant* which, in our case, is equal to 3, as explained above.

S is the area of one side of one piece of tin foil in square centimeters. If desired, this could be changed to square inches by dividing by 6.5, since there are 6.5 square centimeters in one square inch.

D is the thickness of one sheet of the paper expressed in centimeters. There are 2.54 centimeters in one inch. If the builder prefers he can change this figure to inches just as he changed the area of the tin foil. The thickness of the average grade of bond paper would range between .004 and .006 inch. The paraffine would add a slight amount to the thickness, hence it would be best to assume .006 inch as the total thickness of one insulating layer.

In order to show in a simpler case as to how this formula is used, it may be assumed that a fixed condenser for the head phones should be built up first. For the common simple receiving set this condenser need not have a capacity greater than .0005 microfarad. Knowing this, our problem becomes one of finding

how large in area the sheets of tin foil should be to obtain the capacity. This is found by substituting the known quantities in the formula previously given:

$$.0005 = .0885 \times \frac{3 \times S}{1,000,000 \times (.006 \times 2.54)}$$

.0005 is the desired capacity of the condenser.

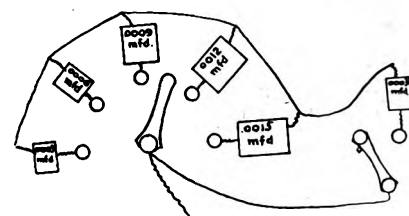
3 is the dielectric constant.

.006 is the thickness of the paper in inches.

2.54 is the number of centimeters per inch.

If this formula is then solved with these figures, it is found that the area of tin-foil sheet required is 28.6 square centimeters. As mentioned previously, there are 6.5 square centimeters to the inch. Thus by dividing the first figure, 28.6 by 6.5, the result is 4¼ square inches. If, then, we take three pieces of tin foil slightly over 2 inches long and 2 inches wide, and place between them a sheet of the prepared waxed paper, the fixed condenser has been completed.

The same principles of design are applied to the variable step condenser for use in the aerial or ground circuit, or across the secondary of the



Method of wiring step-condenser with five steps. The vernier step is shown at the extreme right. It consists of a single step which throws a .0003 mfd. condenser in parallel with the step being used on the main condenser. Drawn by E. L. Bragdon.

loose coupler or other tuning inductance. The maximum capacity of this condenser should be about .0015 microfarads or three times as great as the phone condenser. In order to provide the finer steps of capacity, there should be at least five steps, which is the equivalent of .0003 microfarads to each step. Finally, there should be a sixth condenser of equal capacity—.0003 mfd., which can be switched in parallel with the others for closer adjustment.

Having made the fundamental computations for the phone condenser, in which we used the same materials which will be used in the step condenser, it is merely a matter of proportioning the area of the tin foil to the capacity desired, eliminating the bothersome task of refiguring the formula for each condenser step.

The smallest condenser, with its capacity of .0003 mfd., will have 3-5 of the area of the tin foil in the phone since the amounts of their capacities are in the same ratio, viz.:

Radio Record of Uncle Sam's Ships



(c. Harris & Ewing, Washington, D. C. From Paul Thompson, N. Y.)

Uncle Sam is a master of efficiency in the conduct of his mighty nation and its possessions, and radio has helped him to make his efficiency far-reaching and effective. Particularly with his Army and Navy he is unusually efficient. For instance he must know the exact position—every hour of the day, if necessary—of every craft in his fleets—every craft from the lowliest collier to the gigantic and stately dreadnaught—and in order that this information may be absolutely correct and up to the second, there is a mighty blackboard in the Navy Department in charge of a staff of officers and men, under the direct supervision of Theodore Roosevelt, Jr., assistant secretary of the Navy, at the extreme left of the photograph. As no other institution in the world is better equipped with radio, its use in keeping tabs on the various fleets of the United States Navy gives it an important part to play.

(Continued from preceding page)
.0003/.0005. The area of the latter was $4\frac{3}{4}$ square inches. Therefore, the area of the .0003 mfd. condenser will be 2.5 square inches.

Since each of the four following steps is a multiple of this first one, it is readily seen that the tin foil required in the five steps is as follows:

STEP	CAPACITY	AREA
1	.0003	$2\frac{1}{2}$ sq. inches
2	.0006	5 sq. inches
3	.0009	$7\frac{1}{2}$ sq. inches
4	.0012	10 sq. inches
5	.0015	$12\frac{1}{2}$ sq. inches

There is a point in the construction of condensers which should be understood by the amateur before he assembles the sheets, otherwise the final capacity will be considerably greater than the design calls for. Whereas, 2 sheets of tin foil separated by 1 sheet of insulating medium constitutes 1 condenser unit, 3 sheets of tin foil separated by 2 sheets of paper constitute 2 complete units.

Both sides of the tin foil in the center act as conducting surfaces; hence, instead of 4 such surfaces for 2 condensers, there is need for but 3.

If the above table is worked out further on this basis, it is discovered that each of the 5 steps requires tin foil sheets, $2\frac{1}{4}$ inches by 2 inches as follows:

STEP	NUMBER OF SHEETS OF TIN FOIL
1	2
2	3
3	4
4	5
5	6

A sixth step is then made up for the vernier adjustment and the variable condenser is complete. The diagrams show how the separate condensers are interconnected and, also, how they are connected to the switch and through the switch to the receiving circuit. This will enable the operator to cut in and experiment with any amount of capacity needed, and he will have the aid of the vernier.

Vienna Police Make Arrests by Radio

THE Vienna police have discovered two American citizens who have been swindling people at the various race-tracks. Radiotelegraphy played the important role whereby both men, one a wireless operator, backed the horses heavily just ten minutes after the race was over. A Vienna bookmaker accepted the bets, believing that communication between Vienna and Paris was impossible except by ordinary telegraphy, which takes at least four hours. After the bookmaker had paid out large sums several times, he became suspicious and informed the police. Both swindlers were arrested and admitted the fraud, claiming that, through radiotelegraphy, they had reaped a harvest of gold. Other European capitals, it is said, will use radio in police work.

Radio Making Headway in Canada

By E. L. Chicanot

MONTREAL, June 1. — The radio fever, which has so violently attacked all sections of the United States, has not been halted by the boundary between that country and Canada, and the epidemic has swept this country from coast to coast in the same novel and rapid manner. The general public, made cognizant with the fact that the wonders of wireless, hitherto surrounded with the mysteries of technique, are within its power to utilize and enjoy, has entered eagerly and enthusiastically into the study of radio. Judging by the headway radio has made in business circles as well as social, it bids fair to revolutionize Canadian life in many ways. Railways, newspapers, pleasure resorts, theaters, business houses and thousands of private individuals are installing radio outfits.

Canada has always been ready to adopt wireless inventions in her shipping, her trades, her forests and her fisheries. The wireless service on the Great Lakes, the Gulf of St. Lawrence, and on the Atlantic and Pacific Coasts are second to none in the world in the opinion of navigators. The Canadian trans-atlantic wireless service, in competition with the cables, has been in operation some fourteen years with great success. Authorities declare that no series of wireless direction-finding stations have given such help and satisfaction to mariners as that established by the Canadian government on the Atlantic Coast.

Previous to the general interest awakened in radio in this country, wireless was used in the Dominion in numerous lines of operation. A very fine service was built up by the forestry department of British Columbia as part of its precautions against fires and to keep rangers in instant touch with one another, and with headquarters. Several pulp and paper companies have had communication between different parts of their limits as well as between the limits and city headquarters, by wireless. Excellent results have been achieved with the use of radio in the fishing industry, especially in the annual seal hunt off the coast of Newfoundland, when the work of aviators, flashing back the location of seal herds, has proved invaluable and resulted in much larger catches being made in much shorter time.

In the new wave of wireless interest that is sweeping over the country, new associations have been and are being formed in every section where, through co-operation, wireless entertainment is provided and the intricacies of radio studied. Organizations have sprung into existence all over for the manufacture of apparatus and

A "Juice" Saver



(c. Harris & Ewing, Washington, From Paul Thompson, N. Y.)

Laboratorian of the United States Navy Radio Research Laboratory conducting low electrical resistance tests in radio transmission for greater efficiency of antennas. The result of the use of this antenna will mean a saving of \$30,000 a year at the Annapolis high-power station, by cutting down the consumption of electricity.

the operation of stations. Demands are being made for a greater commercial use of radio, and projects under way are calculated to provide this within a short time. Recently the Maritime Radio Corporation was incorporated at St. John, New Brunswick, to engage in the radio telegraph business and operate both sending and receiving stations as well as to sell equipment. A similar company has been organized at Vancouver and a five-million-dollar company has been incorporated at Winnipeg for the same purpose, while in the various provinces between, many companies are being formed for the purpose of promoting the work of wireless.

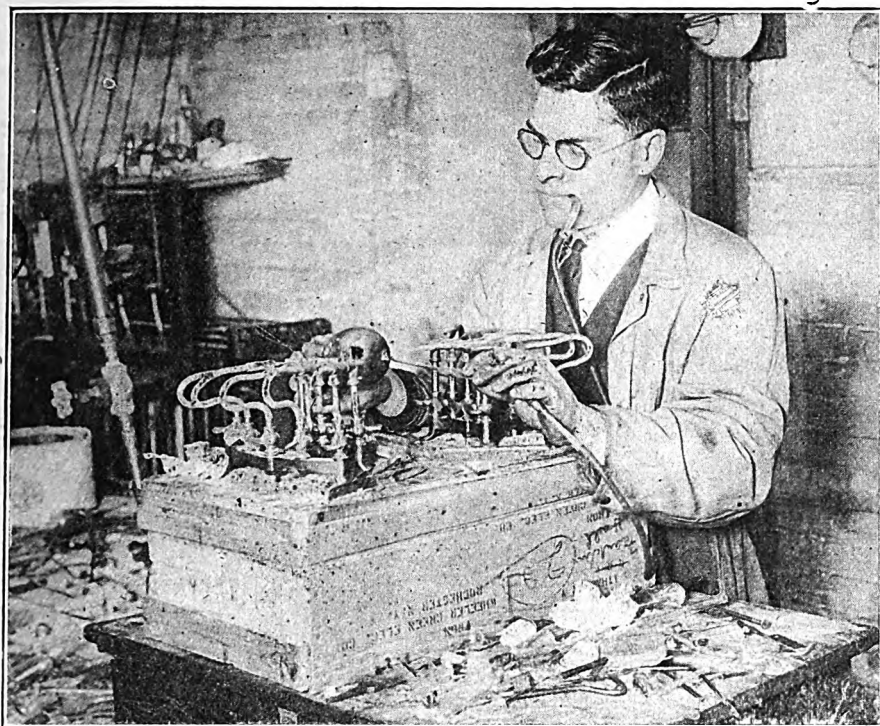
Indications are that the new interest in wireless will bring about an extension of the systems prevailing for the protection and development of various Canadian natural resources. The splendid aid of the wireless in forestry has been ably demonstrated in British Columbia, and now it is intended to install two radio stations in Manitoba for the use of forest aeroplane surveys in the province. This entails, also, the equipment of the flying boats in operation with wireless outfits. Their main work will be that of reporting fires and enabling fighting parties to be transported to the burning areas without loss of time.

The remarkable aid wireless service has been to the sealing fleet has caused Nova Scotia fishermen to petition the Dominion government for a similar service by aeroplane which will, it is expected, considerably aid their work by locating the schools of fish and then telegraphing their whereabouts to the fishing fleets.

The commercialization of radio-telegraphy should be greatly facilitated in the western provinces from the fact that the telephones are owned and operated by the various provincial governments, thus making it a convenient extension to bring the radio system of the provinces under one control. The province of Manitoba is to take the lead in this regard, according to announcements, and enter into the radio broadcasting business at an early date on a commercial basis.

The first passenger train in the Dominion of Canada to be equipped with a radio apparatus was on the Canadian Pacific Railway out of Winnipeg. This was the Live Stock Im-

Students Make Vacuum Tubes



(c. Kadel & Herbert News Service).

Institutions of learning in America are becoming so advanced in radio that a student, on completion of one of the various courses, frequently finds himself well equipped as a graduated engineer. No greater aid for the advancement of radio can be undertaken than the making of vacuum tubes. Professor B. R. Northrup, of the Cornell radio school (in photograph) is blowing glass for the very important vacuum tubes. A collection of intricate instruments may be seen, through the use of which the perfected tube is attained. This is quite a tedious undertaking. Cornell students and faculty are adding their quota to the progress of the world's greatest science.

(Continued from preceding page)

provement Train of seventeen cars which left during May, to tour the province of Manitoba under the auspices of railway and federal and provincial departments of agriculture to promote better farming methods. Two Marconi representatives and a mechanic accompanied the train and successful demonstrations were given each day.

The Canadian Pacific Steamships, Limited, was the first to inaugurate an exclusively Canadian wireless news service to its liners in mid-ocean, supplanting a United States service of a similar method which was discontinued.

Radio, already operating at a high degree of efficiency in Canadian shipping and coastwise circles, has naturally not been neglected in the new interest. A new high-power wireless station is to be erected on Lulu Island, off the British Columbia Coast, to take care of the commercial needs of Vancouver and relieve the Point Grey station for purely maritime work. A radiotelephone service for the British Columbia interior, for

coastwise vessels, as well as deep sea ships as far out as 2,500 miles at sea has been inaugurated with the object for disseminating world news, speeches and concerts. The wireless system at the port of Montreal are also being improved, and now the most intimate touch will be preserved between that port and Port Colborne, Kingston, and other lake ports and as far out as Cape Race, to Atlantic vessels; the radio keeping the harbor commissioners informed of the number of vessels approaching, the character of the cargo, equipment of vessel, its requirements and other pertinent information valuable to procure, ahead of time, to provide necessary accommodation and fit out.

In the words of a noted Canadian authority, "Radio is here to stay and it is going to become a part of our every day life." In September next, a dominion-wide radio convention will be held at Toronto, bringing together the leading figures of Canadian radio circles as well as many United States experts. Impetus and expansion is expected to result from this convention.

New Transmitting Stations Now 19,067

A SURVEY of all radio transmitting stations licensed by the Department of Commerce shows that there are, to-day, 19,067 stations. Of this number 15,495 are amateur stations, 348 experimental and technical training schools, 2,783 American ships, and the balance, 439, commercial stations.

Of this last number, there are 274 broadcasting stations, known as limited commercial stations, twenty of which were licensed the week of May 20.

The growth of this class of radio stations has been remarkable; it jumped from 67 stations a little over two months ago to 274 on May 20. Applications are filed on an average of about three or four a day.

Transmitting Stations

Trans-Oceanic	11
General Public or "ship to shore"...	31
Point to Point	124
Broadcasting	274
American ships	2,783
Experimental	225
Technical and Training Schools....	123
Amateur	15,294
Special Amateur	201

Total

Amateurs by Districts

1. Boston	2,490
2. New York	2,313
3. Baltimore	1,831
4. Savannah	319
5. New Orleans	699
6. San Francisco	1,616
7. Seattle	726
8. Detroit	2,393
9. Chicago	2,907

Total

The Commerce Department does not regulate or record receiving stations, and will not guess at the total number, now unofficially estimated at about a million and a half.

Navy Bids Rejected

Seventeen bids received by the Navy Department last week, for its 30,000 surplus vacuum transmitting tubes were rejected Saturday, and new bids called for June 1. The best bid received was at \$3.17 $\frac{3}{4}$ each. These tubes, although originally purchased for transmitting tubes, can be reslotted and used as receiving tubes. Bids must be made for lots of 10,000 each, and forwarded to Surplus Sales Officer, Navy Yard, Washington, before June 1.

YOUR RADIO VACATION

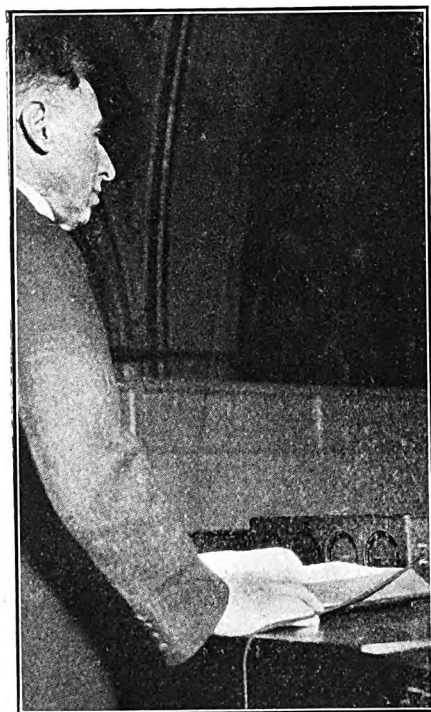
This Summer will be your first Radio Vacation. In the mountains, at the seashore, or in camp, radio will predominate all else. You will need RADIO WORLD. Subscribe for 3 months, \$1.50. Radio World, 1493 Broadway, New York. —(Adv.)

Believes Broadcasting Will Help Church



(Both Photos c. Harris & Ewing, Washington, D. C. From Paul Thompson, N. Y.)

W. E. Collier, sexton of The Church of the Covenant, Washington, D. C., and the transmitting set he operates to broadcast Dr. Wood's sermons.



Rev. Charles Wood

REV. CHARLES WOOD, pastor of The Church of the Covenant, Washington, D. C., preaches three sermons every Sunday and he permits these sermons to be broadcast as far as the ether will take them. Dr. Wood does not believe, as some do, that radio will keep the public from attending places of worship—on the other hand, he is

quite convinced that there is to be a noticeable return to religion through the great interest that is being taken in the new science—that people who hear God's word sent over the wave lengths, will be more inclined to attend church eventually than if no other way of paying heed to divine expostulation had come to them.

When Dr. Wood preaches from his pulpit, every Sunday, his voice comes in immediate contact with the acousticon which the small photograph at the right reveals on the lectern before him. You can see the contact wire running down from the acousticon at his right. This wire then runs up to the loft of the church. You will get a fine view of the loft by glancing at the large photograph at the top of the page.

In the loft of The Church of the Covenant is a well-equipped transmitting plant—the first set of its kind ever installed in a church. It is operated by W. E. Collier, the church sexton, who is seated at the transmitter. The transmitter is a home-made affair that indicates some clever workmanship. On the round table at his right, is the regenerative receiver. At the lower extreme left, is the motor generator which furnishes the necessary power to the transmission tubes. The wave length is 360 meters and the range is approximately 350 miles.

Not only are Dr. Wood's sermons broadcast from his church, but the music as well—and The Church of the Covenant is noted for its fine choir and organ.

This is a stupendous step forward in religion. It proves that the world is stepping ahead, eager to pick up and put to practical use every new invention and turn of science that leads to the improvement of mankind—that the church, perhaps the most retiring of all institutions, appears to be keeping step with all other up-to-date concerns. Dr. Wood may find that his church will not benefit in a financial way because he is willing to broadcast his sermons by radio; but if his innovation leads one lone sinner to the better path it has proved its worth.

Conan Doyle's Prediction

"I expect in the next three or four years some definite messages will be received to prove the contentions of the spiritualists. I believe it will come through radio," said Sir Arthur Conan Doyle, the eminent author and devotee of spiritism, at a reception in his honor at the American Psychical Institute and Laboratory, New York City. "I think it is along this line that we will get our evidence. They have transmitters in the line of ether, and all we must have is the receiver."

Design for an Amateur's Receiving Set

By C. White

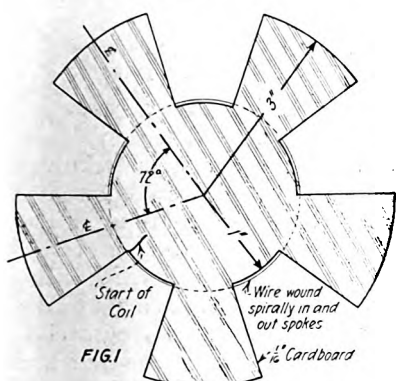


Figure 1.—Cardboard form of the spiral wound inductance coil. Suggested by C. White. Drawn by S. Newman.

THE solenoid or single-layer coil is the type most commonly met with in amateur practice, either as the single-circuit tuner or as the variometer or variocoupler. But, quite often, one cannot secure the proper or desired size of tube, or a lathe is not at his disposal to wind the coil. In such cases, a laborious hand process of winding must be resorted to, or another type of coil must be used. Another very excellent tuner is the spiral-wound inductance. The results obtained from an inductance wound spirally on the cardboard form, shown in Figure 1, are not only superior to the single-layer tuner, but rival the more expensive and complicated double circuit.

For those more mathematically inclined, I may say that the inductance of all or part of such a winding can be found approximately by remembering that for a given length of wire, the inductance is the same wound spirally as on the form shown, or as a single layer solenoid, provided the mean radius of the spiral is equal to the radius of the solenoid. But for the average person, concrete figures have more bearing than generalized formulae or theories. Therefore I shall endeavor to outline and give the specifications for making up a regenerative set using the spiral winding.

First, cut out of good substantial cardboard a form similar to that illustrated. (See Figure 1.) The spokes serve the double purpose of holding the winding stiff and, at the same time, cutting down the distributed capacity of the winding, by spreading the wires in and out around the turn.

Now, begin winding the coil spirally in and out the spokes, using No. 22 single cotton-covered magnet wire. After 40 turns have been put on, suit-

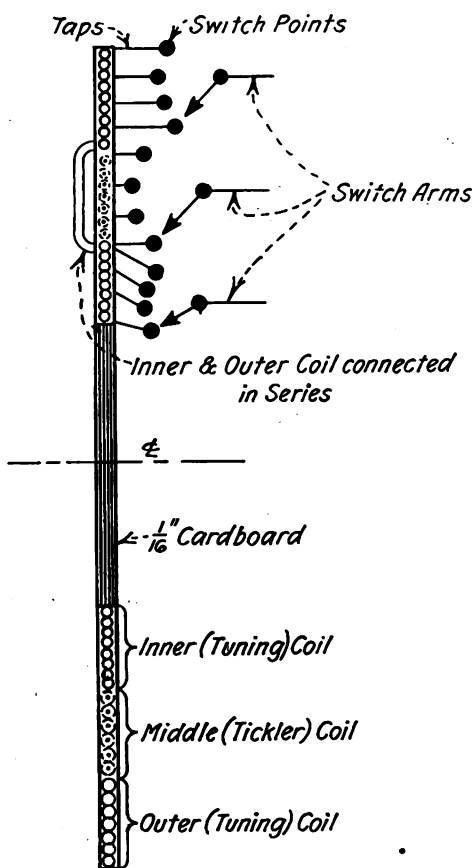


FIG. 2

Figure 2.—Edgewise view of the vertical section of Figure 1. Suggested by C. White. Drawn by S. Newman.

able taps having been made every 10 turns for switch points, 40 turns of wire must be wound on for the tickler coil with 4 taps for switch points. Then after completing the tickler coil, the tuner winding can be continued remembering to leave wire for switch points every 10 turns until the form is filled. The finished coils will have the general appearance of a pancake, with the tickler coil sandwiched in between the inner and outer parts of the tuner. The taps should be connected to their respective switch points as shown in Figure 2.

The condenser equipment consists of three condensers, a small grid condenser and two 23-plate variable condensers with 3-inch dials. The general arrangement of these can be seen in Figure 3. The antenna or tuning condenser in series with the inner and outer tuning coils, while the plate condenser is connected across the phones in the tickler or regenerative circuit. The sole purpose of the latter is to aid, together with the tickler coil, the magnitude of regeneration. The grid condenser should be shunted

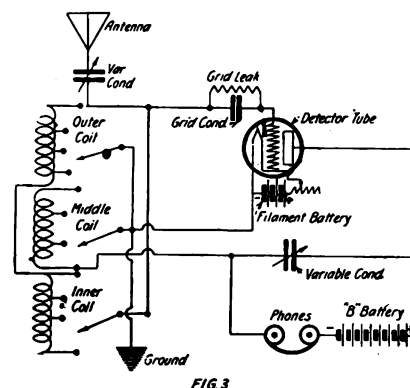


FIG. 3

Figure 3.—Schematic diagram of correct wiring of the regenerative set. Suggested by C. White. Drawn by S. Newman.

by a grid leak of suitable resistance.

One of the most favorable facts that will lead many amateurs to choose this type of set is the extremely low cost, together with simplicity of design and construction. Take, for comparison, the double circuit tuner consisting of a variocoupler and 2 variometers, costing altogether from \$18 to \$24 if purchased already wound and tapped; whereas, the price of the spiral tuner is less than 50 cents, and can be easily and well made in a few hours. It is also true that the condenser equipment is about the same, thus making the single-circuit spiral tuner regenerative receiver the most economical and efficient radio set that can be built.

The double-circuit set has the advantage of being slightly more selective and sensitive, owing to the fact that the secondary or coupled circuit with its condenser has the action of an electrical filter, filtering out all the harmonics in the carrier frequency-wave. But, on the other hand, owing to the fact that there exists a coupled circuit, the energy absorbed in the circuit is greater, hence detracting from the general volume of the receiver. There is a surprise in store, certainly, for the person who hears for the first time the volume and clearness of the signals received on a simple, inexpensive, spiral tuner-set.

Many improvements in design and construction will present themselves to the ingenious worker. The wide-awake amateur can always add a touch of refinement to his panel, hence I hold the actual design of a panel as a matter of personal taste and show no details for the arrangement of switches and dials. But, owing to the small size of the tuner, a smaller panel can be used than would be needed with a double circuit tuner

Radio and the Woman

Latest Gossip About the Feminine Enthusiasts

By Crystal D. Tector

ONE of the busiest women in this country, to-day, is Mrs. W. F. Harlow, who answers the thousands of inquiries that arrive at the Bureau of Standards since the publication of the bureau's booklet which contains data for the construction of an inexpensive receiving set for boys and girls.

* * *

Word comes from an enterprising department-store in Dayton, Ohio, that, because of the great amount of interest displayed in radio by women of that State, store news relating to bargain and special sales will be broadcast from their station. Anticipating prompt results from this effective form of commercial advertising, the firm's mail order department is being enlarged.

* * *

Radcliffe College girls are giving a great amount of time and attention to radio transmitting and receiving.

* * *

The published assertion of Dr. Frank B. Channes, the neurologist, that radio waves will eventually result in curing the ailments of humanity and become a standardized obesity treatment, is read with passing indifference by the present-day flapper, but the news is of more than momentary interest to the woman of more advanced years.

* * *

Atop a certain woman's automobile is a cleverly arranged loop antenna which is designed to stand upright when she desires to use her receiving set, and lies flat when she is otherwise disposed.

* * *

Women would not make such frequent use of the word "radiograph" if they knew for certain that there is no such radio term. A radiograph is a photograph taken by X-ray and has no bearing, whatsoever, on wireless.

* * *

A charming debutante asks, with petulant pout, why, when she's giving a radio party, can't she have continuous dance-music instead of having to listen in on lecture or concert.

And a woman friend exclaims: "I'd give anything, if, when I got stuck for a design for that new sport-wrap the other day, I could have tuned in on a fashion talk!"

Still another inquires: "When will broadcasting stations be able to give

us just what we want and when we want it?"

I can only reply that the time is near at hand when these drawbacks will be adjusted. Meanwhile, despite the splendid efforts of broadcasting stations, it's impossible, it seems, for them to satisfy everyone.

* * *

So that radio shall be enjoyed by woman occupants of State prisons is the end towards which many women social workers are striving.

* * *

Edna Beatrice Bloom's song recitals broadcast from John Wanamaker's New York store, are delightful.

* * *

Thoroughly pleasing to the feminine eye are the rose-and-gold hand-painted loud-speaker horns on display at 18 Murray Street, New York

City. An arrangement which permits the base of the horn to be attached to a wall—and the horn itself when not in use, to be supplanted by a candlestick to match, is a decorative and unique contrivance.

* * *

A dealer in radio accessories tells me that, where, formerly, it was a brother or other male relative who shopped for the girl who wanted the best that money could buy in the way of amplifiers, detectors, or condensers, it is now the girl, herself, who goes about on her own particular shopping tour and makes selective purchases in a way that demonstrates her keen interest in and scientific knowledge of what is best in radio apparatus.

* * *

Managers of broadcasting stations are always receptive to suggestions for programs; and they are particularly interested in what women like. Intelligent, sane, and constructive criticism submitted to them through the mails will reveal our point of view as to what would or would not prove good public entertainment. If you wish to have a voice in the matter of programs, write to managers.



(c. Keystone View Co.)

Miss Victoria Merritt hears a concert through the new radio medium, the victrola, at a recent radio show in Greater New York.

Radiograms

RADIO WILL SUPPLEMENT, NOT SUPPLANT, THE TELEPHONE, according to Brigadier-General John J. McCarthy, vice-president of the American Telegraph and Telephone Co. This is due to the fact that secrecy is still in doubt and that long-distance transmission is seasonal because of atmospheric conditions.

THE LACKAWANNA RAILROAD IS CONSIDERING the establishing of a broadcasting station at Syracuse, N. Y., for the purpose of keeping the trains of its system in touch with division offices and to supply passengers with news.

CONCERTS BROADCAST FROM CINCINATI WERE HEARD IN PUERTO RICO, according to Juan Casellas, of San Juan, who picked up WLW, of the Crosley Manufacturing Co., the most powerful station in the Middle West.

EXPENSES OF COMMUNICATION HAVE BEEN CUT 40 PER CENT. in the War Department by the use of radio. Formerly official messages were sent over the wires of the commercial companies; now radio is used entirely.

THE FIRST RADIO COLLEGE RE-UNION took place, last week, at the University of Michigan, when the Detroit "News" sent out a program of music and talks, including the famous "locomotive" cheer given by ten thousand students.

EIFFEL TOWER STATION, PARIS, NOW BROADCASTS NEWS. The news consists of important financial and political events.

RADIOPHONE SERVICE BETWEEN PARIS AND LONDON is expected soon. Any subscriber to the telephone service of either city may talk with a similar person, or on a ship or airplane during the trip from France to England.

THAT RADIO WILL EQUAL THE LINOTYPE AND HIGH-SPEED PRESS in its effect on journalism, is the belief of Lord Northcliffe, the British publisher. He claims that radio will come into general as a newsgatherer.

A RADIO TIME-KEEPING SYSTEM is the invention of Irving L. Thompson, a war veteran, of Chicago. His claim is that it will do away with the well-known dial clock. His timepiece will have many new elements. It is entirely controlled by radio.

HUNDREDS OF UNEMPLOYED HAVE FOUND PROFITABLE WORK since radio began to boom, according to the Federated American Engineering Society. Since January 1, the society has placed in employment more than 900 engineers, and continues to place about twenty a day.

BRITAIN'S BAN ON BROADCASTING HAS BEEN RAISED by order of the Post-Master General. Permission, however, will not be given generally and will be largely conditional. The amateur of England is, probably, the most law-governed enthusiast in the world.

RADIO FAKERS ARE GOING TO HAVE A HOT TIME when the newly organized Radio Chamber of Commerce gets busy. The Chamber announces that it intends to prevent the marketing of carelessly constructed merchandise and sets that infringe on patent rights.

MORE SHORT-WAVE BANDS FOR BROADCASTING is the gist of the new law proposed in Congress. The use of shorter wave lengths will introduce new problems into radio apparatus manufacturing and allow the establishment of a large number of low-power, short-wave transmitting stations in a small area. Each city will be able to have its own transmitting station.

CONTROL OF AIRPLANES BY RADIO is recorded as a notable achievement in France. A large machine was taken up. The pilot left his controls in the hangar and allowed his "ship" to be maneuvered for over an hour by wireless operators in a land station far below. At a given signal, the pilot resumed control and landed.

THE 740 STATEROOMS OF THE "LEVIATHAN" will be equipped with radio when the giant steamer is reconditioned. Communication from any telephone to any vessel and, in the case of the "Leviathan," to any stateroom, will be possible.

PASSENGER AIRPLANES MUST CARRY SUITABLE RADIO or there will be laws to that effect. Rear-Admiral W. A. Moffett, U. S. N., Head of the Naval Aviation Service, states the above as a possibility. He says that, with such equipment, the lives of passengers will be safeguarded.

OVER 2,000 PER CENT. INCREASE IN REVENUE was derived by the United States Government from private and commercial radio stations, in 1921, over the year 1917. The earnings of these stations is estimated to be in excess of \$1,600,000 and shows a profit of more than 15 per cent. on the government's investment of \$25,000,000.

SWEDEN EXPECTS TO TALK DIRECT TO AMERICA when the gigantic station in that country is completed. An agreement with the Radio Corporation of America and the Swedish State Telegraph board will bring about the undertaking. Sweden's wireless communications are now dispatched from the station at Stavanger, Norway.

Played in Holland, Heard in Ireland

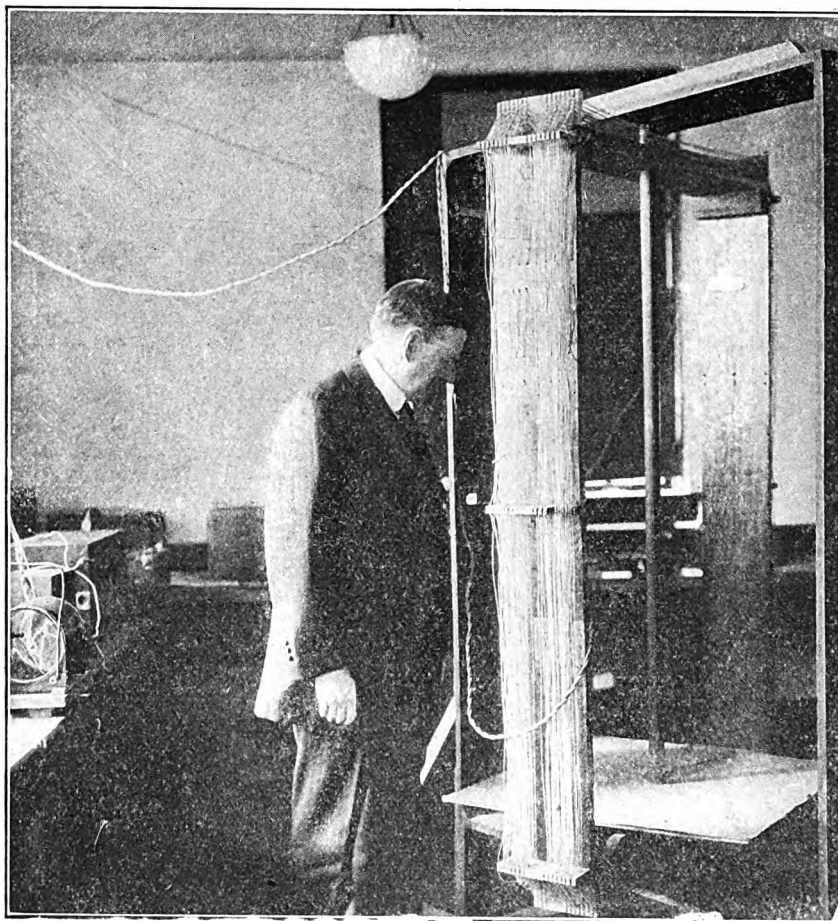


(c. Kadel & Herbert News Service)

The radio receiving-set shown in the photograph was constructed by a clerk in the Tiverton, Ireland, post office, who regularly entertains his friends by music received from Holland and France. The delicate waves are caught by the six-valve high-frequency amplifier and then passed into the two-valve. Note the magnifier shown directly above it. This latter stage increases the sound to such an enormous degree that music is heard with startling clearness from the horn on the table. Although situated so far west from The Hague, Holland, music thus transmitted is about the same degree of loudness as that from an ordinary gramophone. Music from Paris sent daily loses no strength or quality as when played originally in the French capital.

New Pathfinders to Guide Airmen

By Fred Charles Ehlert



(c. Harris & Ewing, Washington, D. C. From Paul Thompson, N. Y.)

(Above) Dr. L. W. Austin, head of the Radio Research Laboratory of the United States Navy, inspecting the loop aerial with which he has conducted tests to reduce atmospheric disturbances, or static, the bugaboo of long-distance radio communications.

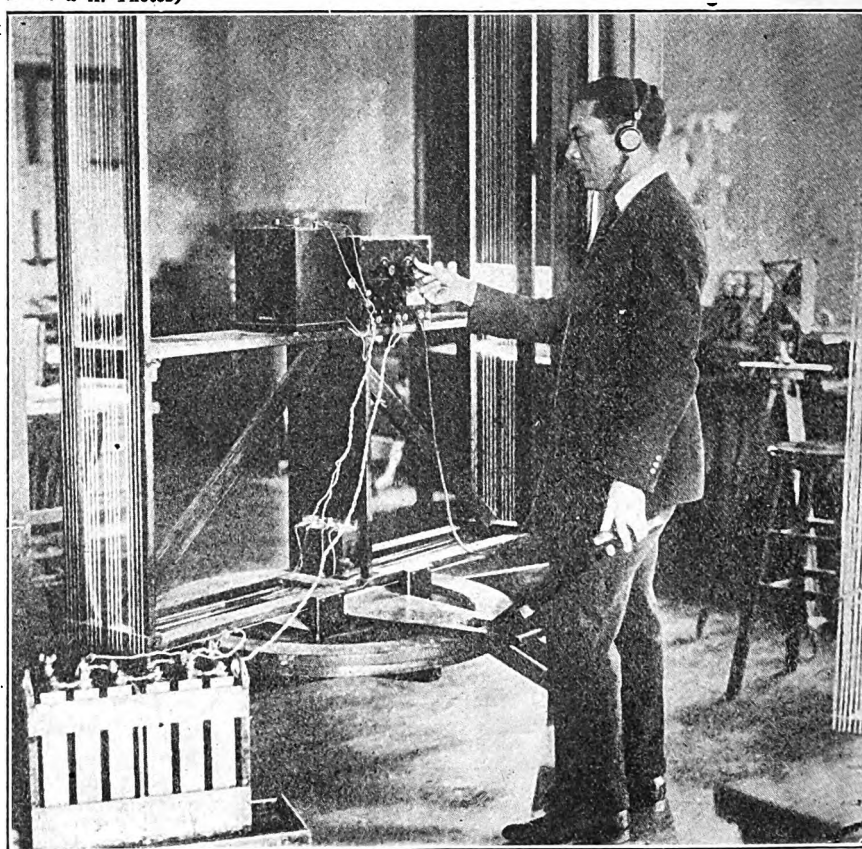
(Below) Direction finder for airplanes operated by the Bureau of Standards, Washington, D. C. One of the experts is conducting an experiment with the necessary equipment. For airplane-direction finding, this large loop-aerial is built on a smaller scale in order that it may be operated in conjunction with an airplane outfit, enabling aviators to know exactly their location, especially in fogs.

RADIO direction-finders and other radio devices have been in use for some time to assist airplanes to land during the night, during fog, or at other time of poor visibility. The most usual method of using radio for this purpose is to transmit from an ordinary elevated antenna at the landing field radio signals which are received on a direction-finder located on the airplane. On small planes the direction-finder may be simply a coil of wire wound on the fuselage; in larger

planes a small rotatable coil may be mounted vertically aft in the plane. This method gives the direction of the landing field, but does not give accurate information as to its distance when the plane is near the landing field.

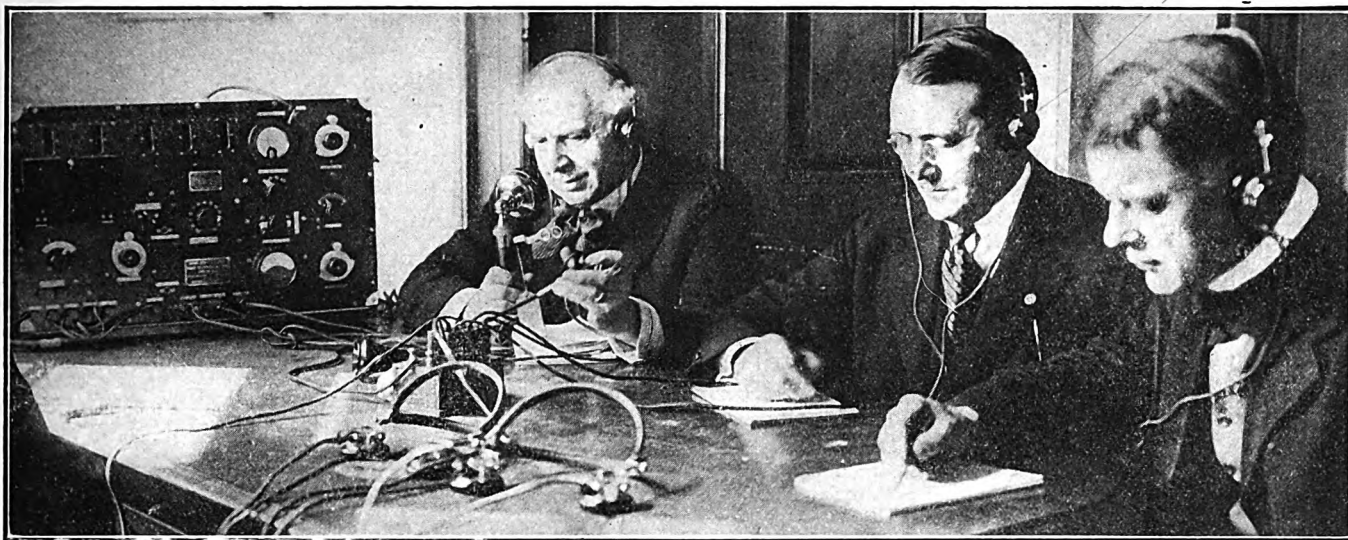
Several years ago, the Bureau of Standards, Washington, D. C., was called upon to develop a method to assist airplanes to accurately locate the landing field when the airplane was quite near. It was desired to develop a method that would give a good signal which would be easily audible over a comparatively large area when the airplane was at comparatively high altitude, but would be localized within a small area when the airplane was near the ground. The accurate location of the landing field is very important when near the ground.

A method of induction signaling was first tried, using 500-cycle alternating current. This current flowed through a large horizontal single-turn coil, 600 by 800 feet, at the landing field. The coil was tuned to 500 cycles, so that a large current flowed. For the induction signaling the reception on the airplane was made using horizontal coils wound on the



(c. P. & A. Photos)

Busy Men Find Radio Booms Business



(c. Harris & Ewing, Washington, D. C. From Paul Thompson, N. Y.)

United States Government departments, in these enlightened days when most everybody has a press agent, spare no pains to "sell" themselves both to Congress and the public. The War Department has rigged up a wireless telephone outfit in the rooms of the House Committee on Military Affairs and has connected it with the department. A good advocate at the other end is explaining to the members of a sub-committee on appropriations, why the department should have more money for this and other projects. The committee members are, from left to right, Representatives Julius Kahn, chairman; William J. Fields, and Frank L. Greene.



(c. International Newareel)

How radio is depended upon by big business men to keep them informed is well illustrated in this picture. A meeting of the directors of the Fidelity Trust and Savings Bank, Chicago, who are going over the bank's business while the radio is keeping them informed of financial and market conditions.

(Continued from preceding page)
lower wings of the airplane. It was found that this method gave a signal which was audible over a wide area when the airplane was near the ground, but was confined to a small area when the airplane was at an elevation of about a mile. This was not satisfactory.

The use of radio-frequency waves was, therefore, undertaken. Two horizontal coils were placed one above the other. The coils were identical in construction, and placed so

that their axes coincided. The current in one coil flowed in a direction opposite to the current in the other cell. A fairly high radio-frequency, suitable for direction-finding work, such as 300 kilocycles, was used.

A calculation was made which indicated that the signals radiated from the two coils would be strongest for an airplane flying in a given horizontal plane, whenever the plane was inside a comparatively small ring-shaped area located above the landing field. After the coils had been con-

structed a careful experimental investigation was made under actual flying conditions, and the results of this calculation were verified. Signals were received on the airplane only when it was nearly above and in the immediate vicinity of the landing field. A Curtiss type biplane was used for the experimental work for both the induction signaling and the radio signaling.

Further experiments in this important branch of radio are being made in laboratory and field work.

Simple Methods of Recharging Storage Batteries

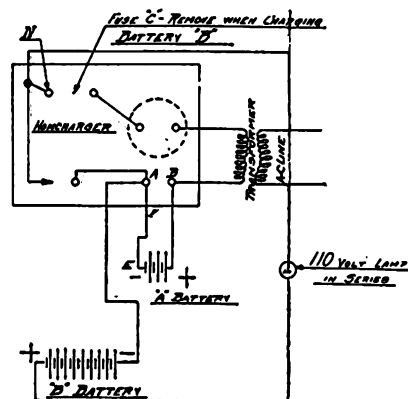
By John Grayson

MINIATURE storage-battery cells are being offered by various manufacturers for supplanting the small dry B-battery used with vacuum tube receiving sets. These batteries consist of from 8 to 50 small cells, and the recharging of such batteries has presented quite a serious problem to the user and is largely responsible for their not being more readily adopted by the wireless enthusiasts.

Where direct current is available, it is a very easy matter to charge these batteries by connecting same in series with a 40-watt lamp. When charging in this manner, it is quite essential that positive battery-terminal be connected to positive line as, otherwise, batteries will discharge instead of charge.

Various types of Homcharges are now on the market for charging the 3-cell A battery used for heating the lamp filaments, and, practically, every wireless enthusiast has one of these machines in order to eliminate the inconvenience and expense of having to lug his battery to a service station every time it required recharging.

Through a very simple scheme of connection it is possible to recharge any radio



Schematic diagram: Lamp "L" burns with less than normal brilliancy when connections are properly made. If the lamp is extra bright, turn off socket immediately and reverse A battery.

B. battery with the same Homcharger that is used for charging the A battery. Figure 1 shows the connections employed.

The Homcharger fuse C is removed, so as to open normal charging circuit. One side of the 110-volt alternating-current line is connected to the armature at N, the other going to positive terminal of the B-battery through a 110 volt lamp-L in series, which acts as a current reducing resistance.

Charging circuit is completed from negative terminal of B battery to terminal A.

The 3-cell 6-volt A battery is connected to the Homcharger terminals A and B in the usual manner. As soon as alternating current supply is turned on, the armature should start to vibrate and act as a rectifying valve, completing the B battery charging-circuit during the proper part of the A. C. cycle, thereby delivering to the B battery a series of intermittent uni-directional current impulses.

It is necessary that either the positive or negative pole of both A and B battery be connected to the Homcharger terminal A. If this is not done, B battery will discharge instead of charge, the same being indicated by the series lamp L glowing with intense brilliancy. When connections have been properly made, and B battery is charging, this lamp burns quite dull.

Making the proper connections is a very simple undertaking.

The material required can be purchased for less than \$2 from any electrical dealer and consists of:

- 1 Two-way Socket Plug or Duplex
- Current Tap at.....\$1.00
- 1 Attachment Plug at25
- 1 Porcelain Wall Receptacle at..... .25
- 1 10 ft. Lamp Cord at..... .50

The two-way socket plug is screwed into lamp socket and the standard Homcharger attachment plug screwed into one side thereof. Another attachment plug is inserted in the other side of current tap, one lead being connected in series with the 11-volt lamp L of the proper size, the other lead running direct to screw N of the vibrator assembly. The other terminal of lamp L is connected to the positive terminal of B battery and the other side of B battery running to terminal A of Homcharger.

Fuse C of the Homcharger is then removed, A battery connected, and lamp socket turned on.

It is impossible to charge both A and B battery at the same time, as with fuse C in place the B battery will discharge through transformer secondary.

As the Homcharger ammeter is not connected when fuse is out, this instrument does not indicate charging rate of B battery. However, when lamp L burns dull, the batteries are charging properly and no other indication is required.

Waves Travel 4200 Miles Pittsburgh Broadcasting Picked up by Vessel in South America

KDKA, the Westinghouse broadcasting station at Pittsburgh, is the first American radiophone station to be heard south of the equator, having been picked up by Frank F. Reb, chief operator of the steamer "Santa Luisa," of the Grace Line, while in the Port of Iquique, Chile.

Iquique is about 4,200 miles directly south of Pittsburgh. In a letter to the Westinghouse Company, Mr. Reb says:

Though the atmospheric disturbances were bad during the test, the selections came in so strong that they were easily heard by Captain Williamson and a number of passengers.

Owing to the fact that your station designated itself too infrequently it was only at the end of the program that we were able to identify KDKA, this prevented us from ascertaining the identity of another broadcasting station heard at the same time, but whose signals or selections came in about half as strong as KDKA and when heard designating itself only once sounded like WFD.

The tests were conducted only while in the ports of the trip, so as not to interfere with radio regulations.

The reception of broadcasting stations this distance and the remarkable intensity of the selections was beyond my expectations



This sketch indicates how far radio waves emanating from station KDKA, East Pittsburgh, Pennsylvania, had to travel to be heard in Iquique, Chili, South America.

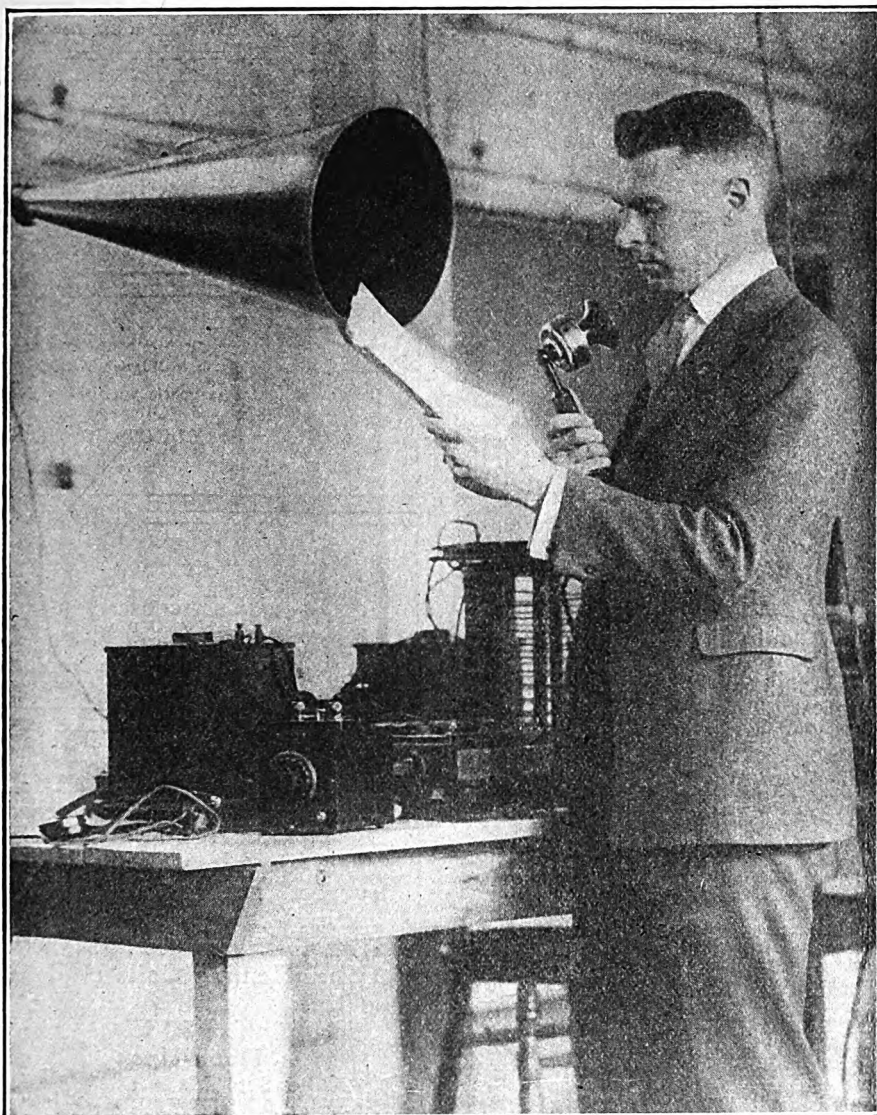
and is without doubt the first time that American radiophone stations were heard south of the Equator.

It is quite possible that the call letters which as Mr. Reb states in his letter sounded like WFD were WJZ, the call of the Westinghouse station at Newark. In this event. Mr. Reb heard two Westinghouse stations the same night; both located over 4,000 miles away.

Don't think that because the fluid in the batteries is distilled that you can drink it. You wouldn't want to be classed with the man who blew out the gas or the one who "didn't know the gun was loaded!"—"Evening Telegram."

RADIO WORLD has found great difficulty in filling all the newstrade demands for copies of various issues to date. We freely acknowledge that we have fallen short by several thousand copies in printing as many as actually were required by newsdealers.

Extra! First Radio Newspaper Here!



(c. International)

Of course, the newspaper cannot be published by radio—for that is out of the question, but every evening, the Boston "American" from its broadcasting station at Medford, Massachusetts, sends out a service that reaches not only thousands of its readers but others who may be listening in. L. D. Trofey, shown at the transmitter, is the official news vendor. Compare him with "ye ancient town crier" who with bell and husky voice, ambled up and down Main Street, calling out news that was over a month old. How times have changed since the days of our greatgrandfathers.

Radio Must Pay Royalties

NATHAN BURKAN, attorney for the American Society of Composers, Authors, and Publishers, has delivered to that organization an opinion in which he claims that the broadcasting of copyrighted songs constitutes a public performance for profit, and that the owners of the copyright are entitled to revenue for such renditions.

The A. S. C. A. and P., recently adopted a resolution that performances such as Mr. Burkan describes, are without license and subject to prosecution. A performing-rights tax-system is being drawn up. Several are under advisement, including a royalty per radio, or a lump sum to be arranged according to the location of the broadcasting station.

A form letter has been sent to all broadcasting stations notifying them of Mr. Burkan's opinion, with the warning that performances of copyrighted music by radio will be prosecuted as an infringement.

This means that if radio stations still care to transmit copyrighted music they will be compelled to apply for license privilege to the A. S. C. A. & P.

The Westinghouse Company, for several weeks, has recognized that the copyright owners are entitled to their equity, and have not permitted the performance of copyrighted music from their station in Newark without permission. Such permission has been readily granted so far; but what the arrangement for the future will be is still in abeyance.

Red hot off the press every seventh day! **RADIO WORLD** is published every week. Have a complete file by subscribing direct or through newsdealers.—(Adv.)

If your dealer sells out, tell him to save you a copy of **RADIO WORLD** every week, or subscribe. \$6 a year, \$3 for six months, \$1.50 for three months.—(Adv.)

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*Everyone will
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The average family, when alive to its possibilities, can and will secure the simple, dependable equipment which gives the home circle the inexhaustible resources of wireless entertainment.

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The Magnavox Radio makes it possible for you to hear all that is in the air as if it were being played by your phonograph.

Any radio dealer will demonstrate for you, or write to us for descriptive booklet and name of nearest dealer.

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Very comprehensive stock on hand.

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TESTED RADIO MATERIAL ONLY

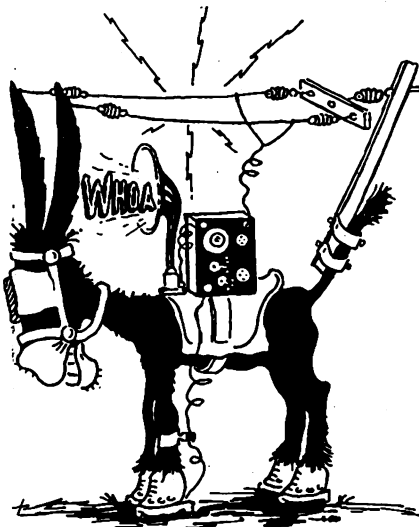
48 plate variable condensers (panel type) .00125	\$4.50
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Regenerative tuner mounted spider web 0-1,000 meters	15.00

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Radio Stopped Him; But What Will Make Him Go?

Cartoon by H. C. Diefenbach



Fewer Hens; More Radio

The following letter recently arrived at the offices of Radio Corporation of America, New York. It gives just a hint of the growing interest taken by everybody in radio, and shows that it pays to mix a little sentiment with a little business:

Dear Sirs,

I have just received your acknowledgment of my order to be shipped c. o. d. but I find that you will have to give me Terms if you are to sell me. I am only 12 (twelve) years old and am a Boy Scout, as I have already told you, and being a Boy Scout I am not able to borrow money from my Mother.

I saw your advertisement in a Boys' magazine some time ago but did not have the Money; but about a week ago a man asked me if I would sell him some hens. He was to come for them but didn't, so I cannot pay the c. o. d. If you would accept Terms, say \$1 (dollar) down and a month to pay I could sell my Hens to the Butcher as they are not be laying and I expect some chicks next week anyway.

I am enclosing a \$1 (dollar) in hopes You will accept my Terms. Please tell the Post Office employees to keep the set at the Post Office until I call for it.

Yours Truly,

We are advised that an executive of the corporation who desires his name withheld, instructed the bookkeeping department to charge the \$15 for the set to his personal account and see that the "Boy Scout" immediately got his set.—"Journal," Providence, R. I.

Ask your dealer to show you the "ARROW"

MAHOGANY VARIOMETER
and the "ARROW" Knock Down Set.
JOBBER—Write for proposition.
Arrow Wire Co., 557 W. 35th St., New York

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RADIO SUPPLIES— RADIO SUPPLIES

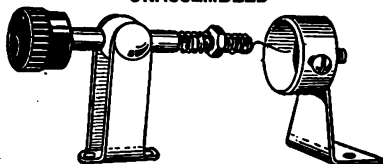
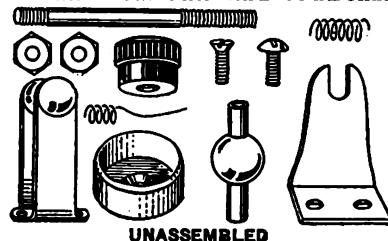
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Remember, the MARVEL is built by the same engineering skill that designed radio apparatus now used by the U. S. Navy, and every MARVEL Set is on a money-back basis. If your dealer is not supplied, send check or money order for immediate shipment from stock. \$1.50 extra will bring you an interesting book on wireless—150 pages, 150 illustrations. Or send 25c for a 72-page illustrated beginner's radio book.

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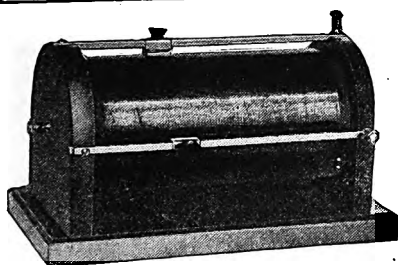
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**Double Slide
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**Radio Supply Service
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The radio dealer needs a new kind of jobber service to meet the demand of a new and different business. North Ward Service is developed especially to meet the need. Give it a trial!

JACKS

- No. 30. Single Circuit Open.
- No. 32. Double Circuit Closed.
- No. 31. 3 Spring Automatic Filament Control.
- No. 33. 5 Spring Automatic Filament Control.

ALL PARTS

Binding Posts (unremovable head).
Fixed Condensers.
Switch Lever.
Duplex Adapter.
Royalphone Receivers.
Complete Crystal Sets.
Crystal Detectors.
Coils.

Get Our Prices and Discounts.

**NORTH WARD RADIO
EQUIPMENT CO.**

Orange St., Newark, N. J.

**Oar-Rigged Antenna on
Rowboat New Radio Stunt**

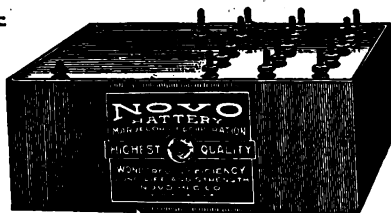
(C. Kadel & Herbert News Service)

Here is a novel and practical radio stunt. The young lady is holding the oar aloft in order to support the aerials and antenna.

A Canadian Radio Prediction

An American friend of mine, says a writer in the Montreal "Herald," who is associated with Mr. Edison, tells me that he is hard at work on a sound amplifier "which, when perfected, will let you hear the ants talk." Sitting in Montreal, you will be able to carry on a conversation with your fiancée in London, precisely though she were sitting beside you. I wonder whether it will be a benefit or not. Mr. Edison, who was 75 the other day, expects to work at full pressure until he is 90.

ALL RIGHT, raise the bonus by a tax on radios.—Chicago Journal of Commerce.

**NOVO****"B" BATTERIES**

FOR RADIO OUTFITS

Noiseless—Dependable—Guaranteed
All standard sizes 22½ to 105 volts.
For Sale by Leading Dealers

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VARIOMETERS**UNWIRED**

Mahogany wood turned cup, white wood ball ready for wiring. Range 175 to 600 meters. Ready for immediate delivery in any quantity. Workmanship guaranteed.

SAMPLE SET, \$1.10

The Ever Ready Woodworking Co.
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**VARIOMETERS
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Price **YANKEE** \$6.00

YANKEE RADIO SUPPLIES

1615 Stiles St.

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Silvertone Talkers, \$10.00

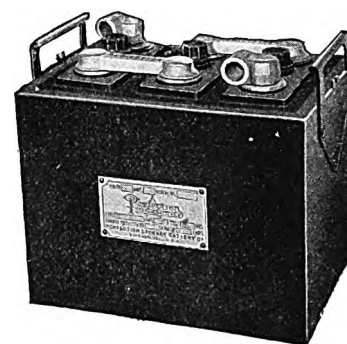
We manufacture a high grade Loud Talker. The horn is made of aluminum and brass, producing the best results. Can be used on any amplifying set, with either single or double receivers.

Price \$3.50

We also make aeriels to be attached to any electric light socket for either crystal or bulb sets.

Reliable Dealers Wanted.

Silvertone Talker Company
1433-1434 DIME BANK BLDG.
DETROIT, MICHIGAN

**Radio Batteries
Ready for Delivery**

WE are ready to deliver radio batteries (A type only) 6 volt from 40 to 120 amperes for single orders, dealer quantities, or distributor quotas where we are not already represented by distributor.

These are not the ordinary automobile batteries. They are specially built for radio work with heavy plates and heavy separators and fully guaranteed.

In writing be sure to state whether this is an individual order or whether you are a dealer with quantity demand or whether you want a distributor's quota.

Perfection Battery Mfg. Corp.

2300 S. La Salle St., Chicago, Ill.

Radio Merchandising

The Cameron Books

Three notable books on radio have just been published by James R. Cameron, whose various books on motion-picture projection have had such wide acceptance in the industry.

Cameron's newest efforts are all for the amateur, and they are notable not alone for their thoroughness but for their simplicity of style. There is no effort to be highly technical, and the treatment in each of the books is such that the most rank beginner quickly will find understanding of points he now feels are vague.

The first of the books, "How to Build Your Own Radio," contains thirty-two pages and sells at 25 cents. By diagrams and the most lucid of explanation, it presents an almost indispensable volume for radio fans who plan to make their own outfits.

The "Radio Dictionary," eighty pages, at 50 cents, contains, besides its 700 definitions of radio terms, many illustrations of radio parts, tables, important statistics, construction advice, and various other data.

The most imposing volume of the three, selling at \$1. is 160 pages of helpfulness that no amateur should be without. It is called "Radio for Beginners." In it, Mr. Cameron has supplied complete information on the installation and care of every type of instrument now used in radio receiving, and he has not been hesitant in mentioning the various types by name. Indeed, he has devoted special chapters to each of the nationally known makes of equipment in addition to his general discussion of the various steps of operation, care and repair. It is profusely illustrated.

The books are being distributed by the Technical Book Company, Bush Building, New York City, N. Y.

THE SELF-SERVICE PHONOGRAPH COMPANY, distributors of the "Rova" line of radio parts and accessories, has moved to new and larger quarters at 167 West 18 St., New York City.

Will All New Firms Join This List?

If you are a new firm and your name is not on our list, send it to Merchandising Editor, RADIO WORLD, 1493 Broadway.

Southern States:

Holt Electric Utility Co., Jacksonville, Fla.

Southern Radio Supply Co., 1601 13th St., S., St. Petersburg, Fla.

Carter Electric Co., 63 Peachtree St., Atlanta, Ga.

National Radio Corp., Atlanta, Ga.

The White Co., Columbus, Ga.

Hi-Grade Wireless Instrument Co., Asheville, N. C.

Carolina Radio Co., Asheville, N. C.

Piedmont Electric Co., Asheville, N. C.

Smith Novotoy Elec. Co., Charlotte, N. C.

A. A. Hartman, Salisbury, N. C.

Clarke Electric Co., Danville, Va.

Southwestern States:

Nichols Radio Supply Co., Bowling Green, Ky.

H. C. Tafel Co., 236 W. Jefferson St., Louisville, Ky.

Nola Radio Co., 134 Chartres St., New Orleans, La.

Rose Radio Supply, 604 Gravier St., New Orleans, La.

Oklahoma Radio Shop, Oklahoma City, Okla.

Hebrick & Lawrence Co., Nashville, Tenn.

Zibart Bros., Nashville, Tenn.

John R. Koch, Charleston, W. Va.

McCray's Store, Fairmont, W. Va.

Radio Gish Auto Shop, Amarillo, Tex.

Southwest Radio Supply Co., Dallas, Tex.

Southern Radio Laboratory, Dublin, Tex.

Galveston Wireless Supply Co., 2006 Avenue B, Galveston, Tex.

Mr. Wayman Davenport, Plainview, Tex.

Port Arthur Radio Laboratories, 2048 Fifth St., Port Arthur, Tex.

Alamo Radio Elec. Co., 608 W. Evergreen St., San Antonio, Tex.

Wace Elec. Supply Co., Tex.
The North Texas Radio Co., Whitesboro, Tex.

Middle States:

Tresco, Davenport, Iowa.
The Radio Exchange, 804 Helen St., Sioux City, Iowa.

The Kehler Radio Laboratories, 901 1st St., Abilene, Kans.

T. & H. Radio Co., Anthony, Kans.

Cos. Radio Co., Wichita, Kans.

Rad. Radio Service, Winfield, Kans.

Detroit Elec. Co., 434 Shelby St., Detroit, Mich.

Saginaw Radio & Elec. Co., Saginaw, Mich.

O. B. Radio Supply Co., 406 Brown Bldg., Omaha, Neb.

Wolfe Elec. Co., Omaha, Neb.

Bullock's, York, Neb.

Lee Brothers, Champaign, Ill.

Apex Radio Shop, 1105 W. 69th St., Chicago, Ill.

The Barawik Co., 25 N. Desplaines St., Chicago.

Chicago Radio Apparatus Co., Inc., 508 S. Dearborn St., Chicago.

Herbert H. Frost, 154 W. Lake St., Chicago.

Haupt Elec. Supply Co., 2442 Ogden Ave., Chicago.

W. A. Hotz & Co., 6325 S. Peoria St., Chicago.

Independent Radio Supply Co., 3716 W. Douglas Blvd., Chicago.

Post Office News Co., Chicago.

G. M. Proudfoot, 361 E. Ohio St., Chicago.

Radio Receiving Shoppe, 4640 N. Paulina St., Chicago.

Klaus Radio Co., Eureka, Ill.

Devore Radio Supply Co., Gibson City, Ill.

Hico Wireless Supply Co., Marion Ill.

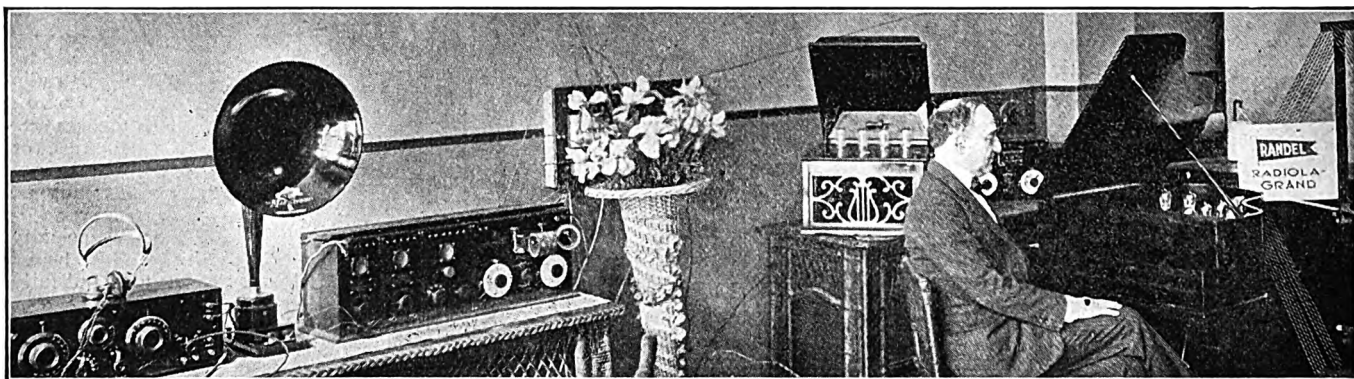
Citizens Radio Supply Co., Box 155, Mattoon, Ill.

W. R. Welton, 1020 N. Prairie, Mattoon, Ill.

Peoria Radio Sales Co., Peoria, Ill.

(To be continued)

One of the Up-to-the-Minute Radio Displays that Secure Business



(The Walters Studio, Newark, N. J.)

A corner in the retail sales department of the Randel Wireless Co., of Newark, N. J. This company makes it a point to keep its retail-demonstration room and sales salon tastily appointed, because not only does it mean profitable business but proves a great aid to the wholesale division.

New Firms and Corporations

(The firms and corporations mentioned in these columns can be reached by communicating with the attorneys, whose addresses are given whenever possible).

The Aetna Radiophone Corporation of America, a five-million-dollar organization for the manufacture of radio products filed its charter at Dover, Delaware, on May 23. The representative is the United States Corporation Co., Dover, Del.

E. R. Knott Machine Co., 1 Ellery St., South Boston, Mass., have established a radio department. Are manufacturing Knott's Sure Ground and their own line of rheostats, condensers and variometers.

The Plywood Tube, Inc., South Broadway, Lawrence, Mass. Capitalization, \$150,000. J. H. Proctor, Andover, Mass., president; Carl J. Olson, Lawrence, Mass., treasurer. Will manufacture plywood tubing adaptable for radio work, wireless, electrical and telephone purposes.

Radio Cabinet Co., 1215 Geary St., San Francisco, Cal. Harry Martin, general manager.

Beaumont Radio Equipment Co., Beaumont, Texas. H. C. Morrow, president.

Pottstown Radio Supply Co., 228 High St., Pottstown, Pa. C. A. Caldwell, manager.

S-W Radio Co., Thomasville, Ga. J. R. Shumate, Jr., president.

Maddell Radio & Manufacturing Co., has opened a factory at 65 East 61 St., Chicago, to manufacture and install radio receiving apparatus. Office address: 6128 Prairie Ave., Chicago.

Radio Products Corp. of America, Wilmington, Del., manufacture apparatus, \$5,000,000. (American Guaranty and Trust Co.)

Coffield Radio Equipment Co., Ellenville, \$20,000; J. S. Coffield, R. E. Xemerer, F. L. Flanagan. (Attorney, O. B. Murray, Ellenville, N. Y.)

Prima Radio Corp., Manhattan, \$15,000; N. L. Forrestal, W. Schilling, G. Klump. (Attorney, H. H. Oshrin, 1,476 Broadway, N. Y.)

Lowenstein Radio Phone Corp., Manhattan, 1,000 shares preferred stock, \$100 each; 4,000 common, no par value; active capital, \$100,000; M. and E. Lowenstein, M. R. Ousack. (Attorney J. C. Wait, 238 Broadway, N. Y.)

Penn Radio Co., Manhattan, \$10,000. W. Curtis, O. Mautner. (Attorney, S. D. Jones, 120 Broadway, N. Y.)

Radio Development & Mfg. Co., Manhattan, \$25,000; N. I. Kaplan, B. F. Isler, M. Ehrenreich. (Attorney, N. Schachner, 88 Park Row, N. Y.)

Wireless Improvement Co., Jersey City, N. J., radio apparatus, \$8,000. (Registrar & Transfer Co.)

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- 3 16" sliders, 15 cents.
- 23-plate variable condensers, \$2.95.
- 43-plate variable condensers, \$3.85.
- Mica phone and grid condensers, 35 cents.

All makes of phones at 50c. below the regular price.

Large Discounts to Live Dealers.

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106 Liberty St. New York City

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(C. Underwood & Underwood)

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Keeps Them Hot

Si Jones for the first time on board a ship of the Navy is being shown around by an officer friend of his. Upon entering the radio room, he is being told of the wonders performed by wireless.

Si—"Gosh dang, but this is a wonderful arrangement." (Then turning to operator, who is busy copying a message) "What do you wear those funny things on your ears for?"

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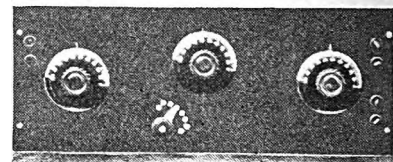
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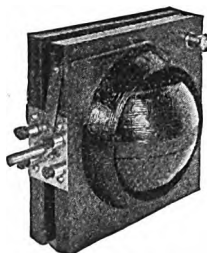
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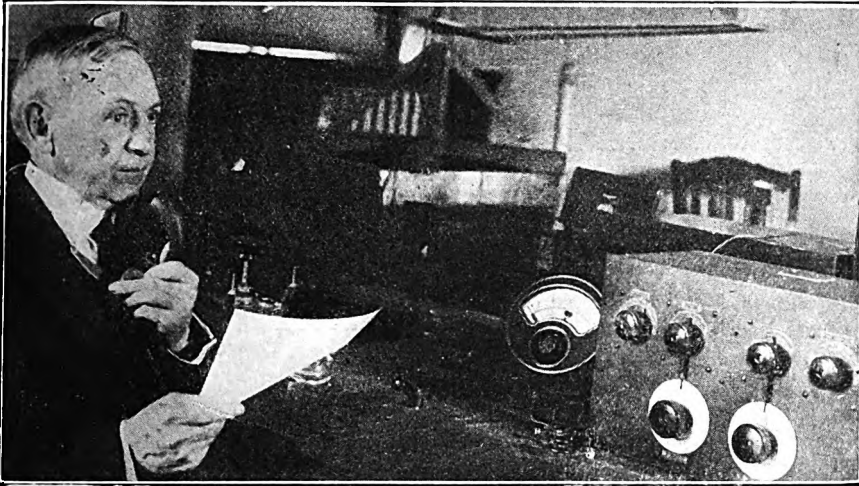
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Seeks Many Hearers With Speech by Radio



(c. Underwood & Underwood)

William Lowe Bryan, president of Indiana University, on a trip to Washington in the interests of the million-dollar drive for a memorial for soldiers to be built on the university grounds, unable to visit all the cities that he wished, broadcast a speech from Washington which was distinctly heard in his own State.

New Kansas City Station

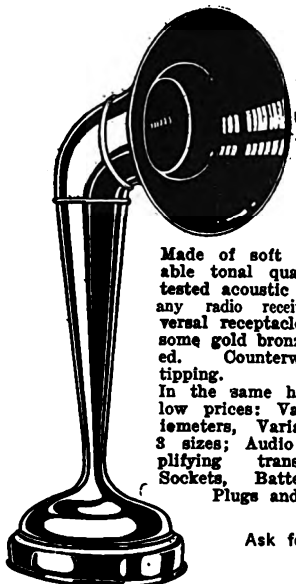
One of the largest inland stations in the United States has just been erected by the Sweeney Automobile School, Kansas City, Mo. The aerials are 325 feet high and the station is equipped at a total cost of \$20,000. An interesting feature is that the call is WHB, known for years to all ships at sea. Concerts will be broadcast at 316-meter length, and market and weather reports from the government at 485 wave-length.

The range of this station covers the whole United States and the power is displayed from a 500-watts W-E set.

Mr. Sweeney has also installed a sound-proof studio where concerts will be rendered. Arrangements are being made to install a pipe organ.

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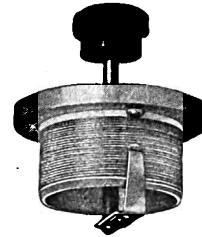
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Answers to Readers

WHICH radiophone is the best to use to hear Chicago and Pittsburgh, and what kind do I need? With a 31-volt home electric-light plant, can I use three cells of my batteries in place of the regular storage batteries that come with a radiophone.—D. S. Ockerman, Scio, N. Y.

There are a number of high-class receivers on the market that will receive music and speech from the stations you mention, but it must be a detector tube with a two or three-stage amplifier. You may use any three of your storage cells for lighting your filaments, but suggest that you switch batteries, using a different unit. This will keep your batteries so that no set will be discharged below the others. As a rule, batteries never come with a radiophone set.

* * *

Having read the article on honeycomb coils, by Fred. Chas. Ehlert, in **RADIO WORLD**, No. 4, dated April 22, I am interested in building a one-step amplifier and, later, a two-step amplifying set. Please enlighten me regarding the hook-up and other matters.—Theo. F. Schuetze, New Britain, Conn.

Read the article by George W. May, R. E., on how to make a two-step amplifier, in **RADIO WORLD** No. 9, dated May 27. We advise you to build a two-step as, no doubt, you will want it after you have seen the results produced by a one-step.

* * *

I have a pair of so-called watch-case receivers, single pole. Can they be wound so as to give satisfactory results in connection with a good crystal set? If so, what size wire should be used?—C. C. Huntington, Mauch Chunk, Pa.

It would be inadvisable to attempt re-winding them, as a single-pole receiver would not respond to the weak signals, in fact, they would not have sufficient resistance. A pair of 2000-ohm receivers would work to a better advantage than a 75-ohm receiver, as in your case.

* * *

I plan to purchase a set composed of two variometers, a detector tube, a grid condenser, batteries, rheostats, and phones. A friend says that I must have a variocoupler for tuning various wave lengths.—Theodore F. Fehlardt, Ripon, Wis.

You need all of the parts you mention, including a variocoupler. Read George W. May's article, in this issue, on short-wave regenerative receivers.

* * *

I intend purchasing a Clapp-Eastham type H. R., regenerative set. I live in an apartment house and find it inconvenient to erect an outdoor antenna. What necessary indoor antenna and accessory apparatus may I use in order to get the maximum efficiency from the outfit?—David Altman, New York City.

For an indoor aerial you will need some steps of radio frequency. In **RADIO WORLD**, No. 7, dated May 13, we published an article by George W. May, and another article by Harold S. Potter, in No. 6, dated May 6, both of which will give you valuable and lengthy information.

* * *

I have a crystal set and frequently hear 9 DGW coming in. Where is this station located?—Edward Rooke, St. Paul, Minn.

9 DGW is the station of F. M. Ende, Fort Riley, Kansas.

* * *

Will an audion tube-detector, work satisfactory in place of a crystal in the circuit I submit? If not would you mind submitting one that would?—W. E. L., Detroit, Mich.

Your circuit is drawn correctly, but advise you to insert a rheostat in series with the filament lighting-battery. Your batteries are termed wrong. They should be vice-versa.

SPECIAL!

Brach outdoor Lightning Arresters..	\$2.50
Brach indoor Lightning Arresters..	2.10
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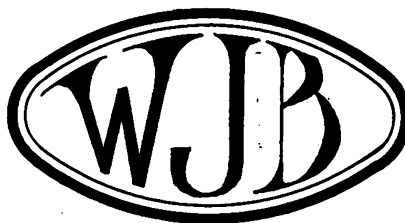
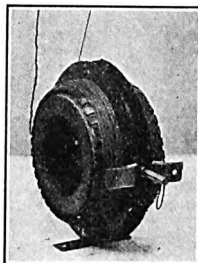
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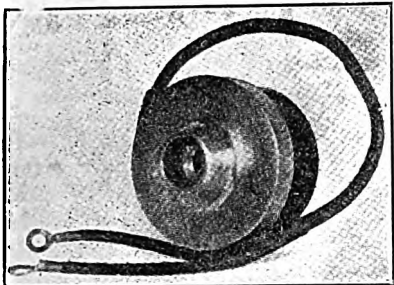
You can earn from \$1 to \$2 an hour in your spare time writing show cards. Quickly and easily learned by our new, simple "Instructograph" method. No canvassing or soliciting; we teach you how, guarantee you steady work at home no matter where you live, and pay you cash each week.

Full particulars and Booklet free.

American Show Card School

41 Ryrie Building

Toronto, Can.



Phone Adapter

Make a loud speaker of your Phonograph by using the "Phone-Adaptor," a Scientific Device which can be used with any make of Radio Head-Phones or Phonograph.

Made from a nickel aluminum alloy highly polished to match the fittings of most expensive instruments.

In ordering be sure to specify make of Head-Phones and Phonograph you have. Immediate delivery anywhere. Satisfaction guaranteed. Price \$1.00 postpaid.

Special discount to dealers in dozen or gross lots.

SEND FOR YOURS NOW

Harry D. Cromer, Agent

30 CHURCH STREET

Room 919,

New York City



(c. Underwood & Underwood)

Radiophone operator of the ocean liner, "America," talking to E. F. W. Alexander, chief engineer of the Radio Corporation of America, at the Engineers' Club, New York. The vessel was a thousand miles at sea when this conversation took place. This established a record for distance in the use of the duplex transmitter for simultaneous sending and receiving.

KEYSTONE VARIABLE CONDENSERS

21 Plate

\$3.55

43 Plate

\$4.50

Our selection of materials and built-up type design give assurance of low energy loss and high efficiency.

Agents and Jobbers write for information.

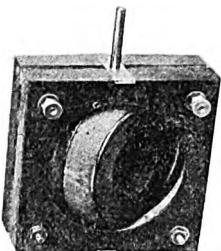
KEYSTONE MOTOR COMPANY

OAKS, MONTG. CO., PA.

S-U-P-E-R-I-O-R

Variometer Model XXX

Positive spring contact on Rotor Shaft overcoming the annoying click of loose bearings. Polished, seasoned Mahogany, insuring against warping and shrinking. Windings are treated with a special insulating compound. Thumb screws on terminals. Price, each, \$4.50.



Vario-coupler Model K

Wound with No. 20 D.C.C. copper wire on the outside primary in two groups, seven taps, eight turns apart, and seven taps single turns apart. And is treated with a special insulating compound. Bearings are self-aligning with positive contact throughout its 360 degrees rotation. Price, each, \$4.00.

DISCOUNTS TO JOBBERS AND DEALERS SUPERIOR RADIO EQUIPMENT CO., Inc.

Manufacturers

OFFICES: 217 W. 125th ST., NEW YORK CITY

Awarded the EVENING MAIL Certificate of Excellence.

Coming Events

MILO E. WESTBROOKE RADIO SHOW.—Letter Building, Chicago, June 25 to July 1.

FIRST CENTRAL WEST RADIO SHOW.—Auditorium, Milwaukee, Wis. Week of June 21.

SPRINGFIELD RADIO EXPOSITION, Springfield, Mass. Under auspices of Springfield, Mass., "Daily Union." June 19, 20, 21. J. P. O'Connor, managing director.

CHICAGO RADIO SHOW, Coliseum, Chicago, Ill., October 14 to 22. U. J. Hermann, managing director, 549 McCormick Building.

CHIEF JUSTICE TAFT'S YALE ALUMNI ADDRESS will be broadcast from the U. S. Naval stations at Anacostia, D. C., and Arlington, Va., June 2. Justice Taft will speak from his home at 9 p. m.

RADIO WILL MAKE YOU MONEY

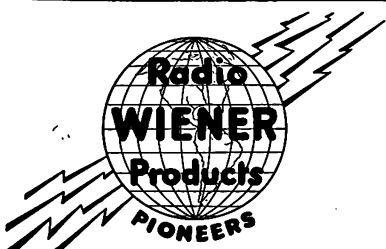
Well known established concern manufacturing WIRELESS specialties offers investors an opportunity to participate in big profits to be made in the WIRELESS INDUSTRY EXPANDING BUSINESS. Not a promotion.

**ALL CAPITAL STOCK—
No preferred shares or bonds
Price Advancing Rapidly**

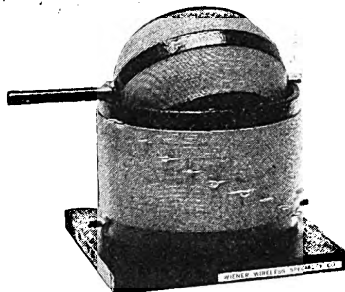
Factory, offices and demonstrating rooms, Testimonials open for inspection. Strictest investigation invited. Call or write for information.

G. BOISSONNAULT CO.

26 Cortlandt St., New York.



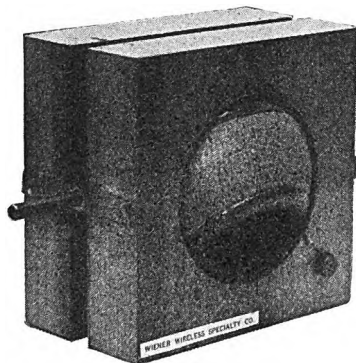
Up-to-the-minute POPULAR SELLERS



The "Wiener-made" Standard
Variocoupler

Price, \$4.50 Each

— A N D —



The "Wiener-made" Standard
Variometer

Price, \$5.00 Each

Our standard variocoupler and variometer here illustrated, are not only attractive in appearance but are manufactured of the best material and in accordance with rigid engineering specifications. In our own factory by competent craftsmen. Each and every unit is carefully examined and tested before shipment assuring uniformity of quality and product.

Our "Induction Units" department in which these variocouplers and variometers are made has been liberally increased in size so that we can assure prompt shipments in any quantity.

**"Every Customer On Our Books
Must Be A Pleased Customer"**
This is our aim and policy.

We are also manufacturers and distributors of "Nerco" 2,200-ohm phones, crystal detectors, variable condensers, fixed condensers, dials, knobs, rheostats, binding posts, galena cups, lever contact switches, switch contact points, insulators, magnet wire, tuning coils equipped with two sliders, V. T. sockets, and complete outfits—THE "WIENER" LINE IS A COMPLETE LINE.

Liberal Discounts to the Trade.

**WIENER WIRELESS
Specialty Company**

21 ACADEMY ST.
NEWARK NEW JERSEY

Cup for Winner of Radio Speed



(e. Underwood & Underwood)

Theodore R. McElroy, of Somerville, Mass., who won the world's amateur championship in the wireless-code receiving contest at the Boston Radio Show, being presented with the championship cup by S. H. Fairbanks, manager of the show. Mr. McElroy received 51½ words a minute.

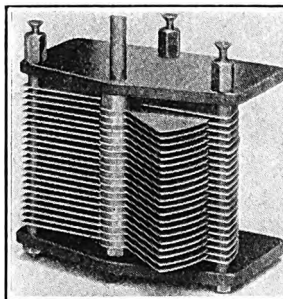
About the only way a girl can get her shape in the papers now is to invent a way to attach a radio outfit to her bathing suit.—"Evening Telegram," New York.

Now that the radiophone has provided the largest audiences ever known for the statesman's words of wisdom, is it too much to hope that he will give more attention to knowing what he is talking about?—Springfield, Mass., "Republican."

RIGHT—ALL WAYS VARIABLE CONDENSERS

3 PLATE	.....\$2.00
13 PLATE	..... 2.75
23 PLATE	..... 3.50
43 PLATE	..... 4.25

Absolutely Guaranteed



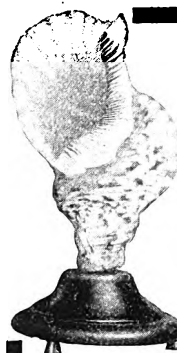
A condenser built for all times—not to satisfy abnormal demand. Heavy Plates, Turned Brass Washers, ¼-inch Brass Shaft, Genuine Bakelite Ends, Positive constant contact on rotary plate-self adjusting.

DEALERS—JOBBER

We ARE making delivery.

Oidar Radio Mfg. Corp.

508 W. 55th St. New York City



Sea Horn Loud Speakers

Nature's perfect amplifier. Positively the loudest amplifying horn offered.

GENUINE SEA SHELLS.

Mounted on rich mahogany finished bases complete with phone-clamp.

13 to 13¾ inches high, \$ 8.00

14 to 14¾ inches high, 12.00

15 to 16 inches high, 15.00

Our smallest shell will produce as much volume as other makes of large size speaker horns.



PRECISION CONDENSERS

43 plate\$4.00

20 plate 3.50

11 plate 3.25

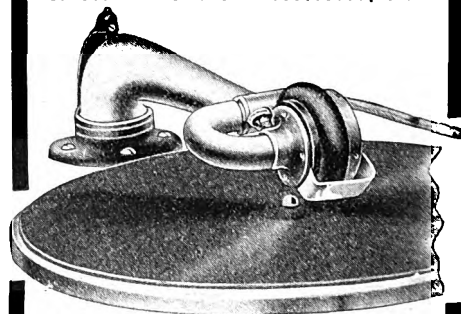
Above prices without dials.

3 inch dials\$0.85

INDESTRUCTIBLE TUBE SOCKETS

May be used for either base or panel mountings.

No. 50. Tube sockets.....\$1.00



USE YOUR PHONOGRAPH AS A LOUD SPEAKER

Our No. 51 phone clamp attaches your phone to the tone arm as shown in cut making your Phonograph a loud speaker.

No. 51. Phone clamp.....\$1.50

Mention make of phonograph with order.

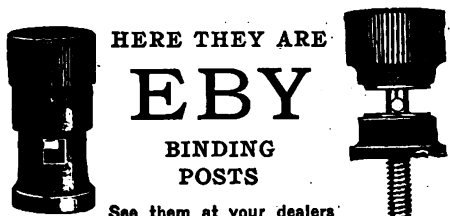
**ALL ABOVE ARTICLES FOR
IMMEDIATE SHIPMENT.
DEALERS SEND FOR SPECIAL
FOLDER.**

**The
Oro-Tone Co.**

Mfrs. of Phonographs and
Radio Equipment.

1010 George St., Chicago, Ill.

Money back if you are not satisfied.



HERE THEY ARE

EBYBINDING
POSTS

See them at your dealers

Corporal

Ensign "H"

H. H. EBY MFG. CO., PHILA., PA.

You will find many Special Values in our display advertisement in Radio World issue May 27 and June 10.

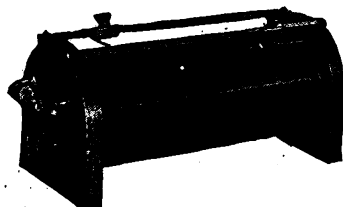
BEACON RADIO and ELEC. CO.
246 Greenwich St., N. Y. C.

\$4.00Ohms
3000

IMMEDIATE DELIVERIES — POST PAID
Audibility Unsurpassed—Money Back if Dissatisfied
Antenna Wire 7 strand Tipped, 150 Ft., \$1.60
TOWER MANUFACTURING COMPANY
11 Station St., Brookline, Mass.

JOBBER— DEALERS

Write for discounts on our
"RELIANCE"
TUNING COIL **\$5.00**
CRYSTAL SET



Wound with No. 21 enameled wire on specially treated tubing, neat in appearance, efficient in receiving, has a range of 600 meters.

IMMEDIATE DELIVERY

We also manufacture:—

A small set at \$4.00

A 2 slide tuner at \$3.50

Unmounted coils in 3 sizes, 6x3, 8x3, 8x3½" at \$1.00, \$1.25 and \$1.50 respectively.

RELIANCE MFG. CO.

354 Mulberry St.
NEWARK NEW JERSEY

F. M. C. RADIO PRODUCTS

We are ready to make immediate deliveries of our "Guaranteed-to-Give-Satisfaction" F. M. C. Radio products.

The Music Box Crystal Set is superior in design and tone to anything in the market .. \$10.00

Post Phone Condenser70

Eyelet Condenser35

Tuning Coils, etc. 1.00

Eiseman Head Sets 8.00

Mail orders promptly filled
Dealers, write for our proposition.
Our Name Is Our Guarantee.

FORD MICA CO., Inc.
14 CHRISTOPHER STREET, N. Y.

When the Noon Hour "Ticks"



(c. Kadel & Herbert News Service)

There is a wireless time-service in almost every country where radio is used which enables anyone equipped with a receiving set to get the correct time. In France, the time is sent out from the Eiffel Tower station daily. Here is a small wireless set no larger than a telephone receiver, on the back of which is mounted a multi-contact detector and a switch as well as the small spools containing the conducting cables and a condenser for changing the wave lengths.

**GUARANTEED
RADIO SETS & ACCESSORIES
NORTHERN RADIO SUPPLY
CO., Inc.**

14-16 Church St., New York
Mail orders promptly attended to.

RADIO For Everybody

Make radio a profession instead of a plaything. You can earn big money as a Radio-trician. Learn by mail, in spare time, how to design, construct, install, repair, maintain, operate, sell and demonstrate complete radio outfits. Write for free 32-page catalog describing our course entitled, "How to Learn Radio at Home."

National Radio Institute, Dept. 1071, Washington, D. C.

The Best Chance You've Ever
Had to Get Fine
VARIABLE CONDENSERS
At Popular Prices

11 PLATE, \$1.25

23 PLATE, \$1.75

Mounted with Bakelite, 25c. extra
Guaranteed on Money Back Basis
Orders Promptly Filled.

**RADER WIRELESS
SPECIALTY CO.**

22 BEDFORD ST., NEWARK, N. J.

RADIO

"The Popular National Radio Journal"

All that its name implies
Get a copy from your radio dealer or
news stand today—20c.

PUBLISHED BY

Pacific Radio Pub. Co., Inc.
Pacific Bldg., San Francisco

De FOREST

"Synonymous for good Radio
Equipment all over the World"



Radio instruments are among the most scientific of all instruments and their manufacture requires not only mechanical skill, but scientific knowledge and appreciation of delicate and intricate instruments. De Forest radio apparatus for amateur, commercial and laboratory use has long been recognized by scientists, engineers and operators as the finest in the world. No attempt has ever been made to meet price competition, our aim having been to provide the radio man with instruments and apparatus which would give efficient, dependable service under the exacting conditions which radio communication has to meet with.

Broadcasting brought about a tremendous demand for radio receiving equipment. Apparatus had to be developed suitable for use

The Everyman Receiver

A simple, easily adjusted, crystal detector receiving set in a handsome walnut finished cabinet, complete with receivers at
\$25.

Radiohome Receiver

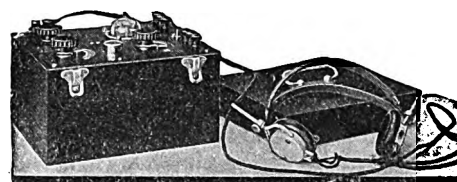
A De Forest radiophone with a vacuum tube detector at \$36. Antenna, phones, batteries and vacuum tube bring the total cost to about
\$75.

DT-800 Amplifier

A two-stage amplifier in cabinet identical with those of the Everyman and Radiohome and giving signal strength sufficient to operate a horn.
\$35.

Interpanel MR-6 Receiver

A set unsurpassed in appearance, efficiency and dependability and having a highly selective tuning system with 150-25,000 meter wavelength range. Price,
\$112.



De FOREST RADIO TEL. & TEL. CO.
JERSEY CITY, N. J.

RADIO WORLD'S QUICK-ACTION CLASSIFIED ADS

This department is intended for everybody who wants quick action on short announcements covering the buying, selling, exchanging or general merchandising in the radio field. Readers of RADIO WORLD will find that it pays to read these columns every week. Advertisers will get a ten-day service here—that is, copy received for this department will appear in RADIO WORLD on the news-stands ten days after copy reaching us.

The rate for this RADIO WORLD QUICK ACTION CLASSIFIED AD. DEPT. is 5c. per word (minimum of 10 words, including address), 10% discount for 4 consecutive insertions, 15% for 13 consecutive insertions (3 months). Changes will be made in standing classified advs., if copy is received at this office before 4 P. M. on any second Tuesday preceding date of publication. RADIO WORLD CO., 1493 Broadway, New York City. (Phone, Bryant 4796.)

SAVE MONEY—Supersensitive galena quarter pound, 55c., half pound, \$1.00. Big sample, 80c. Streif, 73 Flatbush Ave., Brooklyn, N. Y.

BOOK—How to Build the Home Radiophone. Send ten cents—Radio Service Institute, U. S. S. Bank Building, Washington D. C.

VARIABLE CONDENSERS, 23 plate, .0005 M. F. Panel type, accurately made and adjusted, big value, \$3.80, postpaid. Zeunert Co., 1752 N. Park Ave., Chicago, Ill.

Big Money and Fast Sales—Every owner buys Gold Initials for his auto. You charge \$1.50; make \$1.35. Ten orders daily easy. Write for particulars and free samples. American Monogram Co., Dept. 198 East Orange, N. J.

Crystal Set That Gets Radio Concerts. Build it right boys. Plans and full instructions for building at low cost, high grade fine adjustable Crystal Receiving Set, fifty cents postpaid. Dept. R. D. Shaw Mfg. Co., Galesburg, Kans.

INSULATORS FOR AERIALS—Support your antennae properly. Prevent current leaks. Our antennae insulators are of hard glazed porcelain, the ideal insulating material. Made to withstand a pull of 2,200 pounds. Light, strong, inexpensive. Write for samples and full information. THE FEDERAL PORCELAIN CO., Carey, Ohio.

LOFT FOR RENT—124 East 14th Street. Immediate possession. For terms, apply L. B. Schindler Co., 148 Duane St., N. Y. C.

MAGNAVOXES
Type R-3. Immediate shipment from stock. Aerolian Co., Bethlehem, Pennsylvania.

WANTED.—A second hand Omnigraph with Morse Code Records. Must be in good working order and cheap. Russell Traymore, Box 71, East Pittsburgh, Pa.

GUS KLEIN AND C. V. ROSS will be in charge of the new and larger store which E. Klein & Bros. have opened at 34 Park Place, New York, to be known as Klein's Radio and Electric Supply Co. Prompt attention will be paid to local and mail orders, wholesale and retail.

THE WHOLESALE RADIO EQUIPMENT CO., 24 William St., Newark, N. J., a co-partnership, Bernard Miller, president of the Economy Auto Supply Co., Newark, N. J., and Mortimer Salzman. This company intends to deal in complete radio sets and parts as distributors. Mr. Salzman advises that \$16,000 is in the treasury and an additional \$20,000 is available when wanted.

"MIRACLE"

RECEIVING SET



\$25

Complete with Double Head Phones

Also Copper Antenna Lead Wire, Ground Wire, Insulators and all the necessary parts that will enable you to hear everything within a range of from 25 to 50 miles.

Also included is a radio text-book with complete instructions and valuable charts.

SHIPPED PARCEL POST INSURED UPON RECEIPT OF MONEY ORDER OR CHECK

Metro Mail Order Co.
358 Fifth Avenue, New York City
Send for a "Miracle" to-day

New Army Radio Stations

Two United States Army radio stations have been added to the Signal Corps radio net; one at Jefferson Barracks, Missouri, and the other at Fort Leavenworth, Kansas.

Batteries for Radio. Guaranteed two years, full eighty ampere hour capacity, \$16.35. All orders filled day received. Peterson Battery & Radio Service, Detroit, Minnesota.

Loudspeaker Attachments (rubber) fit victrola, etc., \$0.40 prepaid. Two-step Amplifier, complete with Baldwin Loudspeaker, \$45.00. Max Veneske, Troy, Pa.

LOOK—While they last, new UV-201 Radiotrons, \$5.50. Federal Phones, \$7.00. Kellogg, \$9.00. 43-plate Panel Mounting Variable Condensers, \$4.00. 23-plate, \$3.50. Fada Switches, \$0.40 Rheostats, \$0.85. Acme Amplifying Transformers, \$4.25. General Radio, \$4.25. Federal, \$6.25. Order NOW. Russell Hall, North Ave., Washington, Pa.

Guaranteed Ganaerite Crystals exceptionally sensitive. Mounted Crystals, \$0.50, postpaid. Special discounts to dealers. Haigh, Chapin & Co., Box 178, Cranford, New Jersey.

50 Clapp Eastham Regenerative Sets and some H. Z. Audio Frequency Amplifiers. All brand new and latest models. My price is less than others, ask and there is no mistake about quality. Get your order in before supply is exhausted. Mayport Radio Co., Mayport, Penna.

Immediate Delivery—Radiotron UV-201 Amplifier Tubes, \$6.50. Kellogg, 2,400-ohm Phones (special), \$10.00. Nickel Plated Switch Points, dozen, \$0.36. Switch Stops, \$0.05. Switch levers, 1" or 1 1/2" radius, \$0.50. Attractive Binding Posts, \$0.10. Detector Cups, \$0.20, postpaid. O. Ohambelrain, Berea, Ohio.

PATENTS—Electrical cases our specialty. Pre-war charges. B. P. Fishburne, Registered Patent Lawyer, 386 McGill Bldg., Washington, D. C.

First Radio Dog Story

An Airedale terrier in the receiving room of the University of Kentucky, one night, recently, heard his owner, F. Paul Anderson, dean of the University, call him from



(c. Wide World Photos)

The new "His Master's Voice."

the Westinghouse station at Pittsburgh, Pa. "Jerry" was asleep when his master's voice came in. He jumped to his feet, wagged his tail, and cavorted before the set.

Books Received

M. B. Sleeper. "Radio Hook-ups." 1920. Norman W. Henley Publishing Co., 2 West 45th St., New York.

P. E. Edelman. "Experimental Wireless Stations." 1920. Norman W. Henley Publishing Co., 2 West 45th St., New York.

A. C. Lescarbours. "Radio For Everybody." 1922. Scientific American Publishing Co., 233 Broadway, New York.

Complete Crystal Receiver including Phones, \$20.00. Gilbert Rich, Sharon, Mass.

Use Your Electric Lights for Aerial, buy Wolverine Aerial Plug, \$3.50. All radio goods carried. Money back guarantee. Write, L. M. Emery, Lyndonville, Vt.

Radio Crystals, Cube Galena, Steel Galena and Pyrite Crystals. These minerals have been tested and guaranteed extra sensitive. Ounce, 25c. Pound, \$2.00. Special prices to dealers. The Western Research Corp., 516 18th St., Denver, Colo.

Enclose Self-addressed Envelope and receive free bulletin of various designs from which you may build your own Receiver from our blueprints. The blueprints show full constructional details, wiring diagram, bill of material and necessary data and we guarantee the performance of the model. Price of blueprints varies as to subject desired. Ask for bulletin No. 349. Experimenters Information Service, 220 West 42nd St., New York City.

We Manufacture All Radio Parts in large quantities. Logan Machine Co., 222 South Clinton St., Chicago, Ill.

Radio Cabinets—Parcel Post, Prepaid. Made of seasoned wood, stained beautiful walnut or mahogany. Front rabbited to receive panel, top hinged—knock down, screws included. To fit panels 6x7, \$2.00; 6x10 1/2, \$2.50; 6x14, \$2.50; 6x21, \$2.75; 9x14, \$2.75; 12x14, \$2.75; 12x21, \$3.25. Prompt shipment. H. N. Fitzgerald, Onancock, Va.

Regenerative Tuner and Detector in Cabinet, \$20.00. Two-Step Amplifier, \$30.00. Single Tuner and Detector in cabinet, \$25.00. Marconi Code Records, \$4.00. Baldwin Phonograph Attachment, \$12.00. Short Wave Variometer, Detector, Two-Step in cabinet, \$65.00. H. Denyse, 203 Speedwell Ave., Morristown, N. J.

We Save You Money On RADIO SUPPLIES

Radiotron amplifier tubes, 201 \$ 5.85
Western Electric Phones 2200

Ohms, per pair 13.50
Murdock No. 56, 3000 Ohms

per pair 5.40

Federal 2200 Ohms, per pair.. 7.20

Paragon rheostats, each 1.35

Paragon amplifying transform-

ers, each 4.50

Paragon V T. sockets, each .. .90

R-3 Magnavox, each 40.50

The above are special June prices

ONLY.

Mail orders shipped day received.

FREE DELIVERY EVERY-

WHERE

except on the Magnavox. This will

be shipped express collect.

A. V. GREGORY

41 BROAD ST., RED BANK, N. J.

A REAL VARIABLE

THE HAYNES VARIABLE CONDENSER was designed before it was built. IT DOES NOT LEAK. DEALERS—Here is a condenser worth twice its price, yet there is plenty in it for you. Write for particulars. We can make delivery.

The Haynes Radio Shop
629 Lexington Avenue, New York City

RADIO

How and why radio works and essential information to get results. 48 pp., illustrated. Send 25c.

25c

Agents Wanted

RADIO HANDBOOK PUB. CO.
Sheridan Bldg., 9th & Sansom Sts., Phila., Pa.

DEALERS

Communicate with us regarding Detectors, Binding Posts and other radio parts.

C. R. BAIRD COMPANY

243 EAST 151st STREET, NEW YORK

Wholesale and Retail

Radio Supplies

PARK ROW CYCLE
& RADIO CO.

29 Park Row, N. Y. C.

Entrance Basement Store.

something different?

RADIO DIRECTORY WHERE TO BUY

RADIO RED BOOK

WHERE TO GET THAT HARD TO GET PART

RADIO RED BOOK

406 W. 31ST ST.

Your Dealer - the Newsstand

Another Attractive
Proposition offered by

Randel



— 3 inches —

A perfectly constructed dial made of the best dielectric material—pure black—accurately balanced—clearly engraved white figures from 0 to 100 are scientifically arranged as illustrated, affording fine adjustment—bored for 3/16 and 1/4 inch shafts.

Price, \$1.00 each

Send \$5.50 for sample box of 10.

Liberal discounts in quantities.

RANDEL WIRELESS CO.

9 CENTRAL AVE.

Newark,

New Jersey

Navy Department Sells Its Excessive Vacuum Tubes

THE Navy opened sealed bids on 30,000 surplus vacuum transmitting tubes, which are being sold in wholesale lots of 10,000 at the Washington Navy Yard, on Monday, May 15. These tubes were originally designed for transmitting, and fit ordinary commercial transmitting sockets, but may also be used for detecting and amplifying by reslotting the receiving tube socket about 45 degrees from the usual slot. This is essential, it is pointed out, because the retaining pin in the lamp base is about 45 degrees from the position of the re-

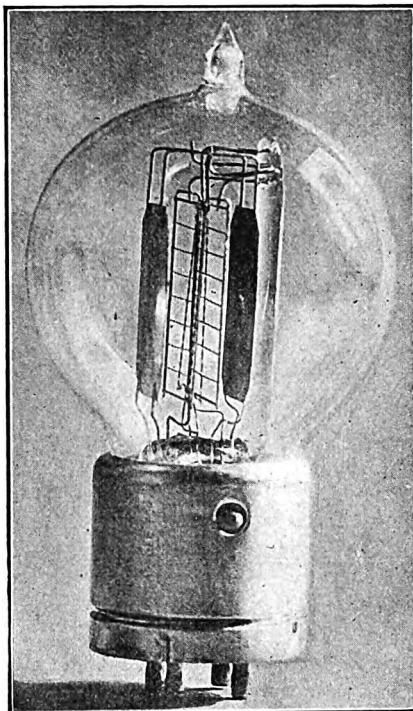


Photo by Paul Thompson.

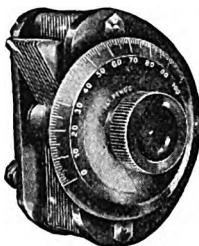
Type E transmitting tube used by the United States Navy. It is said to be one of the most efficient tubes ever made.

taining pin as ordinarily in receiving tubes sold to-day. When these tubes are retailed, they must be sold in their original cartons to licensed amateurs only, for experimental or entertainment use. The fact that they are several years old and that they were originally purchased by the Navy as transmitting tubes, must be shown on the label. In case the retailers fail to comply with the regulations of the Navy Department, the tubes will be seized and the payments forfeited.

A NEW VARIABLE CONDENSER



Manufactured by Radio
Stores Corporation. Patent
Pending. Type VC-1



Concealed Counterweight. Brass Studs through Aluminum Plates: Die Cast Shaft Held in True Center Through Brass Bushings. Binding Posts Mounted on Separate Metal Straps. No Insulating Material Tapped—Brass Inserts Throughout.

Immediate Shipment

List—28 Plate\$4.25
48 Plate 4.75

Complete with Knob, Dial and Counter Weight. Each packed in individual carton.

RADIO STORES CORPORATION

National Distributors and Manufacturers
218-222 W. 34th St., New York City

RADIO

EVERYTHING FOR THE AMATEUR
FOR IMMEDIATE DELIVERY

De Forest Crystal Set (Inc. phones)	\$25.00
De Forest Tube Set	36.00
De Forest Two-Step Amplifier	35.00
Westinghouse Crystal Set (Inc. phones)	25.00
Westinghouse Sr.	65.00
Crystal Detectors,	
500., 750., \$1.00, \$1.25, \$2.75	
Bakelite Dial 4 in.	1.25
Bakelite Dial 3 in.	.90
Bakelite Panels 6 1/2 x 9 in.	1.25
23 Plate Variable Condenser	\$3.25 4.50
43 Plate Variable Condenser	3.75 4.75
De Forest Amplifying Transformers	6.50
Varimeters ..	\$4.50 5.00 5.50
Varlocouplers	4.00 4.50 6.00
Lightning Arrestor Branch	2.50
De Forest Rheostats	1.20
Tested Galenas, Sillicon, Radiolite	.35
Aerial Wire, 100 ft. ..	50c 75c 1.00
Catalog and Radio Book	.50
Books on Radio	10c. 25c. 35c. .75
Plans for Complete Sets	.50
Contact Points, a doz.	.30
Switch Levers, 1 in., 50c. 1 1/2 in.	.60
Alcohol Torches	1.00
Tuning Coils	\$3.00 3.75
Tube Sockets	90c. 1.00
Phone and Grid Condensers	.30
Variable Grid Leak and Condenser	.75
Fixed Condensers	75c. .95
Lighting Switches, 500 Volt. D. C.	2.94

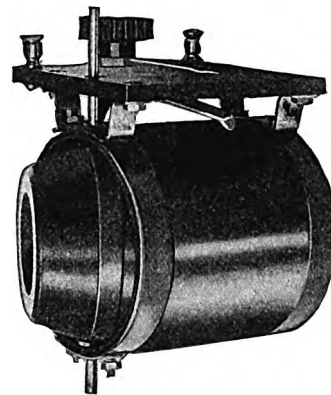
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Our "EVERY-WIRE-CONTACT" Coupler as illustrated is made strictly along scientific lines—the primary coil has a lever contact affording an every-wire-adjustment of this element which eliminates the disadvantages of the old style primary or tuning coil with soldered taps and its poor selectability—at the same time the rotor is accurately fixed with perfect air gap allowing further finer tuning—the unit is ideal for use in regenerative or crystal sets.

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HE unprecedented profit producing power of syndicate and chain drug, cigar, grocery stores, etc., etc., lies in Co-operative Buying.

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On demand R. B. S. agrees to refund to any subscriber to our service, the full amount of his subscription, providing we do not save the member a minimum of \$125.00 on each thousand dollars worth of Radio Equipment we are able to purchase for him.

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A saving of ten times the six months' membership fee on every \$1,000 of purchases OR MONEY REFUNDED.

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Please file our application for membership in the Radio Buyers' Syndicate, it being understood that in the event of our application being approved that we are to enjoy all benefits such as discounts, etc., accruing to members, and furthermore that you will refund our membership fee for six months in the event of your not saving us \$125 on every \$1,000 of purchases as stipulated in your guarantee.

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Enclose check for \$12.50

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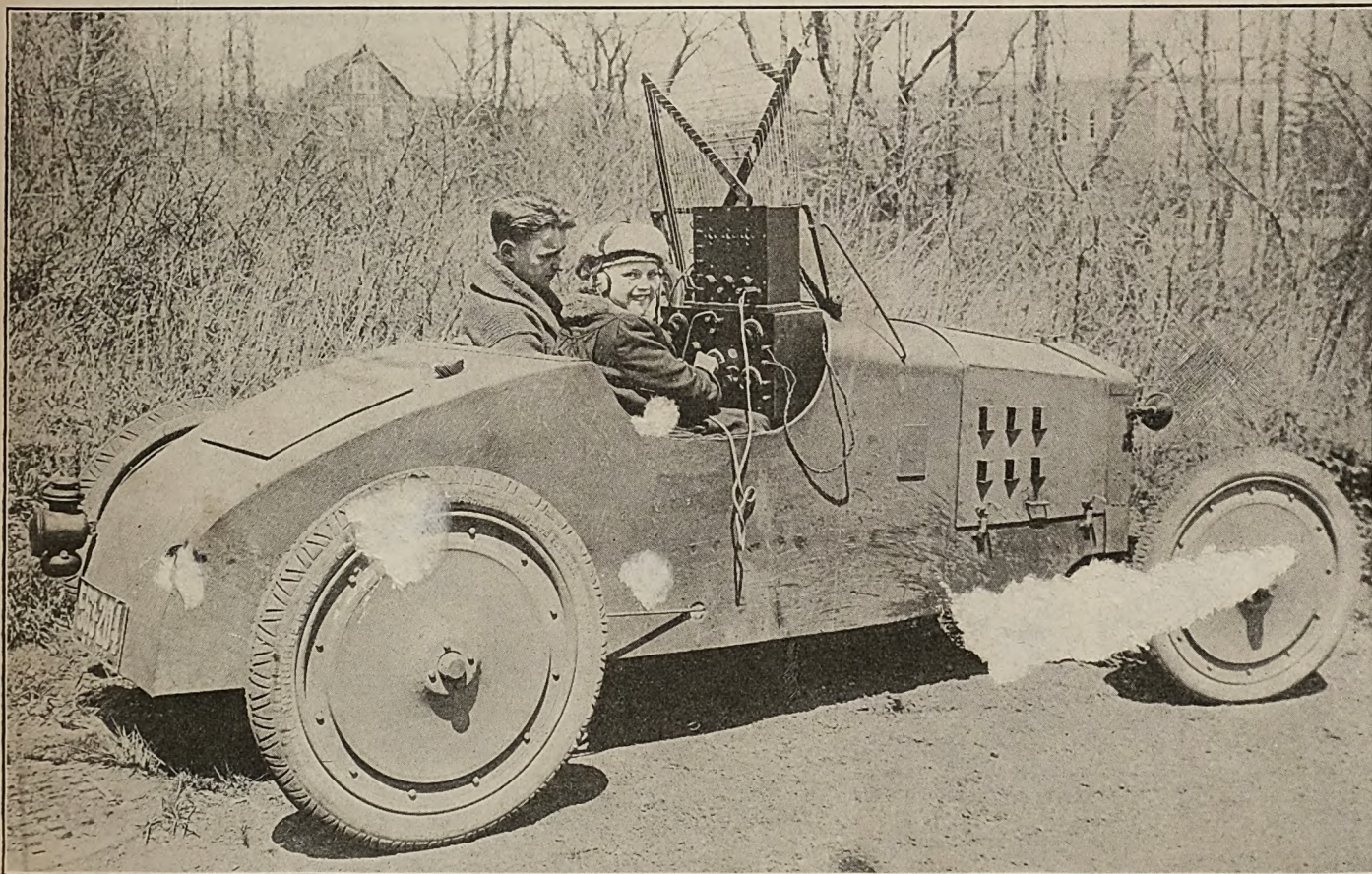
New York City

RADIO WORLD

Entered as second-class matter, March 28, 1922, at the post office at New York, New York, under the act of March 3, 1879

I L L U S T R A T E D

Designed Car and Installed Radio Set



(c. Ewing Galloway, N. Y.)

R. E. Leppert, Jr., age seventeen, in his car with his sister, Vera Leppert, age eleven. Mr. Leppert designed the car. It is his idea of what a roadster should be. He also installed its radio set. This clever young man, who resides at Harrison, N. Y., with his parents, is the radio expert of his home town. Even the school teachers come to him for wireless advice. He has been an amateur mechanic since he was four years old. The receiving set on his automobile works absolutely perfect.

Are You a Member of the N.O.D.C.? See page 20

GOOD NEWS!

You Can Receive Radio from an Ordinary Lamp Socket If You Use **DIDARC**

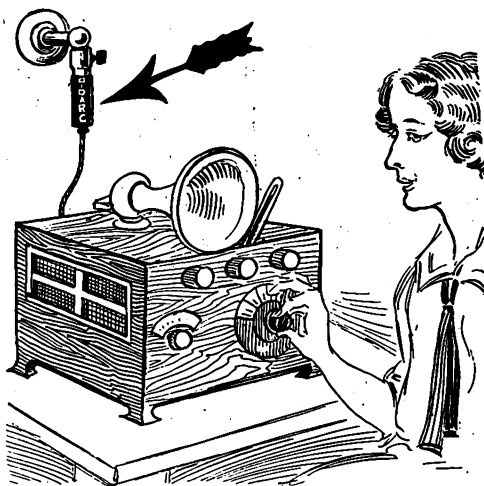
And you can use your set in any room in the house

YOU WILL NOT NEED AN AERIAL

Because the electric-light wires in your home pick up broadcast concerts. And the DIDARC is the simple way of connecting your receiving set with any electric-light socket.

YOU WILL SAVE MONEY

Because DIDARC also does away with switches and lightning arrester and you keep the money they cost.



YOU WILL HAVE A PROTECTIVE DEVICE

Because DIDARC safeguards your set and prevents shocks and short circuits.

IT WILL INCREASE SIGNAL STRENGTH

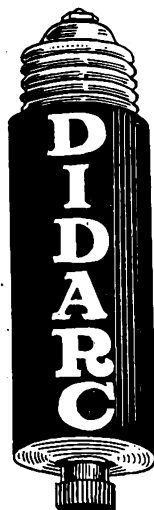
Because it will enable you to hear the broadcasting free from interference and static.

YOU WILL BE HAPPY

Because DIDARC does away with all manner of trouble that the radio fan must avoid.

DIDARC is the newest device in the great improvement that is taking place almost daily in radio.

It is the very thing that the American family needs to free it from lightning worries, and the objections of landlords and fire underwriters.



May Be Used With Crystal or Tube Set

On Alternating or Direct Current Electric Lighting

List Price \$2.50

Manufactured by the makers of

The Grin



VARIABLE CONDENSER FOR

The ATLANTIC RADIO CORP.

Sole Owners and Distributors

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Go to Your Local Dealer. If He Cannot Supply You, Our Mail Order Department Will.
Jobbers and Manufacturers, Write for Our Proposition.

RADIO WORLD

[Copyright, 1922, by Radio World Co., New York, N. Y.]

A WEEKLY JOURNAL, PUBLISHED EVERY WEDNESDAY AND DATED SATURDAY BY RADIO WORLD COMPANY, FROM PUBLICATION OFFICE, 1493 BROADWAY, NEW YORK, N. Y.

Vol. 1. No. 11.

June 10, 1922

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Perfect Radio Arrangement Guides Leviathans of the Deep



(c. Ewing Galloway, N. Y.)

Correctly adjusted radio-equipment is one of the most necessary essentials of every ocean liner. The photographs show the advancement made in radio on two of the largest passenger steamers plying the Atlantic. (Upper left) E. Brent, third radio operator of the White Star Company's "Majestic," the largest ship in the world. Mr. Brent is holding a goniometer, the heart of the Marconi Company's patents, which determines the exact location of a ship in a fog by getting the direction of shore messages. (Upper right.) The aerials of the "Lamport" and Holt liner "Vauban." (Lower center.) Wireless room on the "Majestic." At the left is the Marconi radio compass. Next is the large wave-transmitter with a 2,000-mile range; and next, at the right of the man at the key, is the short (800-mile) range. The large transmitter is a tube set, and the short one is a spark set. F. W. Garwood, chief operator (standing), is listening to telephone messages.

Radio Receiver for Short Waves

By George W. May, R. E.

AFTER receiving a large amount of literature published recently in regard to radio, I have come to the conclusion that amateurs experience difficulty in the operation and construction of a short-wave regenerative set. The trouble encountered can be divided into two classes, namely:

1.—Inability to tune to a sufficiently short wave-length.

2.—Difficulty in controlling the regenerative effects so essential in receivers of this type.

For receiving on short wave-lengths, that is, up to 600 meters, the circuit using plate variometer and grid variometer with a vario-coupler, is by far the most popular. This circuit has been in use for some time. A set of this type will be found in nearly every amateur station. To the layman, the different circuits used at the present time are more or less confusing and it is hard to pick out the one that is needed. For best results on all wave lengths, the honeycomb

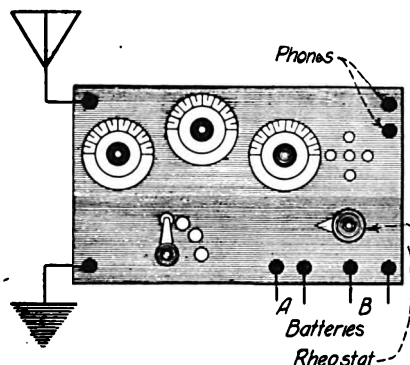


Figure 1. How the front panel should appear. Suggested by George W. May. Drawn by S. Newman.

coil set is hard to beat; but the set described here is better for the short-wave lengths. The honeycomb set will receive on the short waves but this set is a little better. For broadcasting, this circuit cannot be surpassed.

In regard to trouble No. 1, inability to tune seems to be the stumbling block. This is not the fault of the operator, but the fault of the improperly designed secondary circuit. Manufacturers incorporate too large a wave length in their receivers. The result is that the instrument will not tune to amateur wave-lengths. Most of the sets placed on the market today will just barely tune to 200 meters; only a few will tune to 159 meters. In the case of the second difficulty where the plate circuit fails to

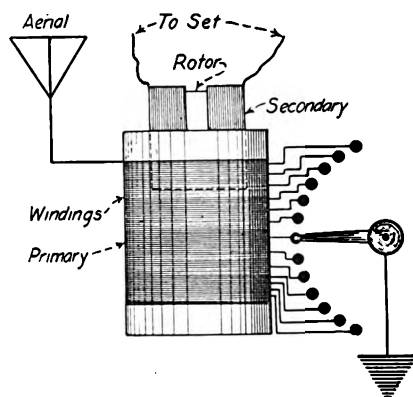


Figure 2. Detail of the method of wiring the variocoupler. Suggested by George W. May. Drawn by S. Newman.

regenerate properly, the trouble can generally be traced to improper connections or, perhaps, to incorrect plate-voltage. Trouble, in this respect, can be overcome by a little experimenting; for instance: by reversing the secondary connections, or even the B battery connections. It may be that the improper plate voltage is being supplied to the plate. These obstructions can best be overcome by experimenting, because various tubes have different characteristics, which require specific amounts of current for successful performance.

For the best results, the parts should be purchased, although they may be built at home with more or less success. Two variometers will be needed, as well as one variocoupler. Of course, a vacuum tube will have to be used with this circuit. A rheostat, storage battery and B battery must be used with it.

At a later date, a two-stage amplifier may be added that will greatly add to the pleasure of receiving the music. The set may be mounted on a bakelite panel with knobs on the outside for adjusting the instruments. The necessary binding posts may be added in this way. In order to see if the filament is lighted all right, it is necessary to have some sort of a window in the panel for the operator to look through. This may consist of a few small holes drilled in the front of the panel. It will also serve to sheath and ventilate the panel inside the cabinet, and let out the heat caused by the tube. Arrange the panel in such a way that the tube, socket, and rheostat are located in one end, and the variocoupler in the middle with the two variometers, one on each side. Before attaching any of the instruments, lay out the work very care-

fully being particularly careful to keep all the wires as short as possible.

Remember that every bit of wire added makes just that much more resistance to the current and, consequently, will cut down the signal strength.

Another advantage of careful planning is the fact that a lot of howling and squealing may be eliminated this way, especially if amplifiers are added to the set. The best size of wire to use is about No. 22 tinned copper wire. Have a good spool of this wire insulated.

Insulation for this may be bought in any radio store. It is known as "spaghetti." This, simply, is slipped over the wire. It makes a very nifty appearance if properly applied, and the amateur may make a very neat job if he uses two colors, one for the filament wires and the other for the rest of the circuit. By doing this he will also lessen the danger of getting the B battery through the filament. Of course, if this happens, the tube is burnt out almost instantly and the tube might as well be thrown away. The receiving set is capable of all sorts of refining. The best way to perfect one, is not to hurry.

If an amateur does not care to construct this piece of apparatus, it may be purchased for a few dollars; but for the benefit of those who prefer to make everything, the directions follow:

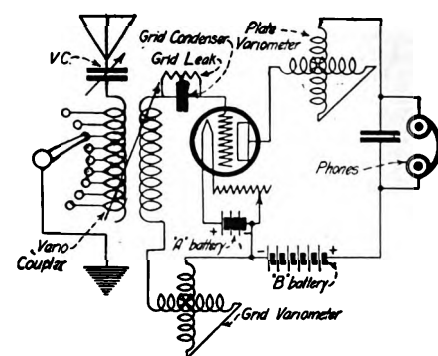
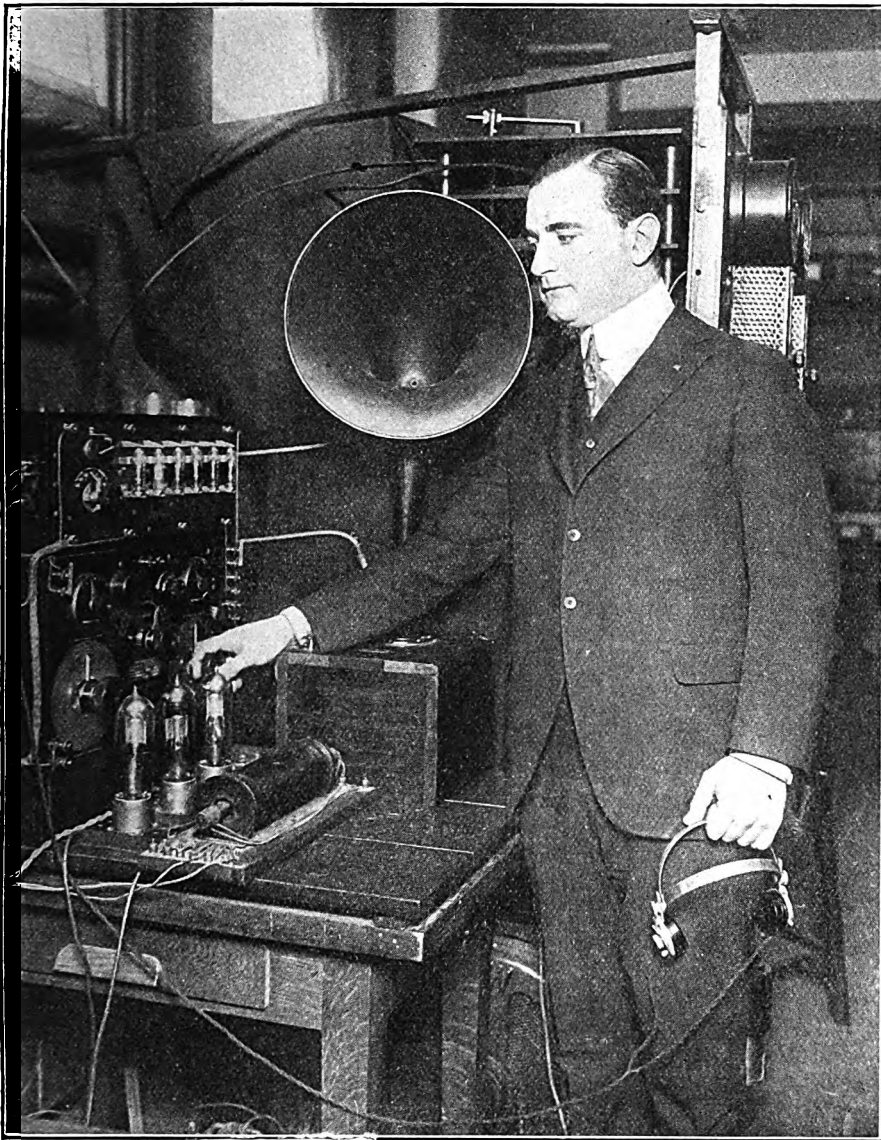


Figure 3. Schematic diagram of the wiring of the completed set. Suggested by George W. May. Drawn by S. Newman.

Secure a cardboard tube, 4 inches in diameter. Give it several coats of shellac. This improves the insulating qualities and prevents the tube from changing shape owing to atmospheric conditions. If this is not done, the tube is very apt to shrink so much that the wire will become loosened and, eventually fall off. This tube, when it is dry, may be wound with

Received Signals from Europe



(c. Kadel & Herbert News Service)

Professor Alfred N. Goldsmith, Radio Expert and Secretary of the Institute of Radio Engineers of New York, demonstrating some startling developments in the laboratories of City College of New York. Professor Goldsmith treated his interviewers to some radio signals which he received from the Great Nauen Station, near Berlin, Germany, which filled the room with sound. Once in a while a little jazz music from the station at Elberon, New Jersey, was tuned in which was twice as loud as the original phonograph emitted it. Professor Goldsmith is tuning in on a Navy-type receiver with a loud-speaking device.

Pertinent Advice on Electric Light Hook-ups

By Carl Hawes Butman

IF you do any experimenting in power-line broadcasting, as explained recently by Major-General George O. Squier, U. S. A.—don't try to connect up with the electric-light lines without using condensers. If you do, you will short-circuit the lights, blow out fuses, and, perhaps, ruin your instruments. Referring to his recent demonstration of wired-wireless broadcasting locally over a city's electric light system, General Squier pointed out the necessity of using condensers to avoid short-circuiting. He explained to the writer that an ordinary transmitter and receiver are used, connections being made by a suitable plug in a light socket, and may be connected to the power line in various ways; but the preferred method provides for the installation of condensers between the mains acting as by-passes for the high-frequency currents only, permitting the power current, direct or alternating—but of low frequency—to flow along. For radio, he says, the two mains are connected in parallel and used as one conductor, the ground being a return. Good results may be obtained by connecting the transmitter and receivers between the mains suitably protected by condensers to keep the large-power current from passing through the radio apparatus.

The advantage of using line radio for local broadcasting on light wires saves the erection of aërials, leaves the ether open for long-distance communication, eliminates interference, and permits an unlimited number of messages to be sent on different wavelengths.

As an advertising feature, it has been pointed out that agents of phonograph records might well give daily concerts for the benefit of possible purchasers who were listening-in through their lighting system. For that matter, any commodity could be advertised by this system which takes up no band in the ether. Although advertising is prohibited in regular broadcasting through aërials, by the recommendations of the Radio Committee, and will probably be barred by the bill soon to be introduced in the House of Representatives, there is no reason why it could not be employed by a local power company operating a line-radio broadcasting service for its subscribers.

(Continued from preceding page)

No. 24 double cotton-covered wire. The wire will be tapped about every ten turns. This tapping process is very easy, as the wire is wound on the tube.

When the tenth tap is reached make a loop in the wire allowing it to remain about one inch long. By doing this, it will allow you plenty of room for soldering the wire to the multi-point switch. By taking the various taps off in this manner, all the way up the coil, you will have your primary. A small cardboard tube may be secured that will turn about the inside of the larger tube. This, of

course, will have to be shellacked as was the larger tube, and wound with the same size wire—say about 40 or 50 turns. Leave necessary room for the shafts which will have to be pushed through the larger tube in such a way that the smaller tube will rotate about inside the larger tube. When finished, set the coil aside and proceed with the variometer.

The units for the variometer may be purchased complete or, simply, the parts may come wound with wire. After you have the variocoupler and variometers complete, secure your panel and rheostat, then mount according to the accompanying diagram.

How to Construct One- and Two-Slide Tuners

By George W. May, R. E.

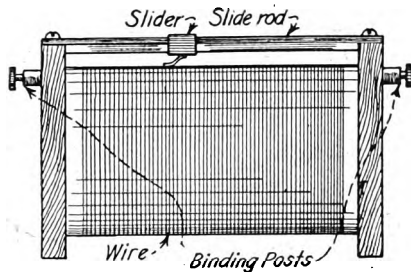


Figure 1.—How a one-slide tuning coil should appear. Notice the position of the slider and slide rod with binding posts. Suggested by George W. May. Drawn by S. Newman.

INQUIRIES are made frequently, especially by beginners, concerning the most efficient hook-ups for the different types of slide tuners with crystal detectors. There are amateurs who believe that these slide tuners were made only recently or in fact only since broadcasting came into use. Ten years ago, I was using my two-slide tuner with which wonderful results were obtained. There is no doubt that many new fans who try out the crystal set fail to bring in the music from various broadcasting stations simply because of improper tuning and assembly. Of course, there are many other causes for failure, such as poor crystals, loose connections, and, probably, poor aerial and ground.

If a good ground and aerial are to be had with a good slide-tuner, proper tuning would be the important factor provided a good piece of mineral is at hand. With all this in view, one should be able to hear at least from

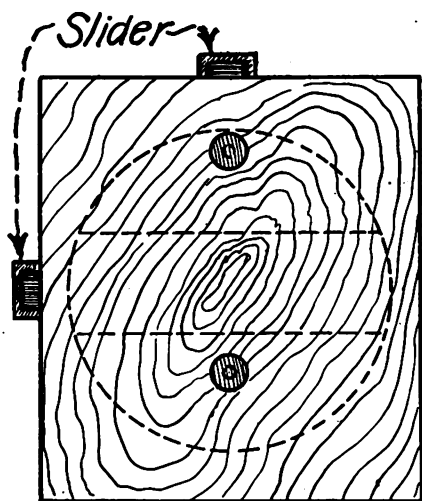


Figure 2.—Side view of the end section. Suggested by George W. May. Drawn by S. Newman.

20 to 50 miles, the latter distance responding under favorable weather and atmospheric conditions. I have heard the human voice at a distance of a hundred miles. This, under favorable conditions, was a surprise to me.

The beginner who uses, or contemplates using, a crystal set will find that there are two types of slide tuners on the market: Single-slide and double-slide tuners. I will describe first the construction and data of the single-

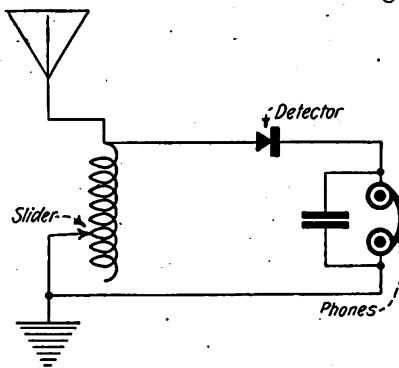


Figure 3.—Schematic diagram of a one-slide tuning coil. Suggested by George W. May. Drawn by S. Newman.

slide tuner. The method of winding the tuner is as follows: A cardboard tube, 4 inches in diameter and 8 inches long, is secured. Shellac the entire tube and allow to dry, which will only take a short time. Wind this tube over the entire length with No. 22 B & S double cotton-covered wire, making sure that the wire is placed on evenly with no breaks or kinks.

For the ends of the tube, use a seasoned piece of wood cut to the shape shown in the drawing. When this is done, shellac the tube again, covering all the wire with a thin coat. This will tend to hold the wire more firmly and give a neat appearance to the tuner. With the coil now wound and ends placed, all we have left is the sliders. Most radio stores handle sliders and slide rods; therefore, it is preferable to buy them—and they may be bought cheaper than they can be made. Usually the slide rods come either brass or aluminum; but I suggest brass. The thickness will be one-quarter inch. When purchasing, be sure and get sufficient to cover the entire length of the coil. Usually the slide rods come with the sliders; but, if not, simply see that the correct sliders fit the rod nicely. When the sliders and rods are available, mount

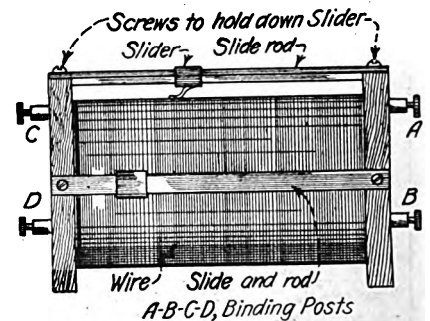


Figure 4.—A two-slide tuning coil. Particular attention should be given to the layout of both sliders, slide rods, and binding posts. Suggested by George W. May. Drawn by S. Newman.

the rod and slider in such a manner that the slide rod can be screwed down to the ends and the slide rods are able to slide along, touching each turn of the coil. When this has been done, mount two binding posts. Connect one end of the wire to a binding post and one end of the slider to the other, as shown in the schematic diagram, leaving one end of the coil free and one end of the slide-rod free.

Everything now seems to be finished. Only one small job is left undone: to scrape off the covering from the wire on a line where the slider runs over, thus enabling good contact between slider and copper turns of coil. When all is accomplished, the maker may use his own judgment in regard to the mounting. If the beginner connects up his tuner, according to the diagram shown, some remarkable results should be obtained. This depends on the erection of a good aerial and the seeking of a good ground.

Probably some beginners would like to cover the two-slide tuner which, of course, is a somewhat better instrument. It gives you a little more leeway in tuning; and if a two-slide tuner is made at the start, it will enable the beginner to get a good idea of exactly what is needed to get results and it will help him when he graduates into the tube class. A crystal set will also make him appreciate the

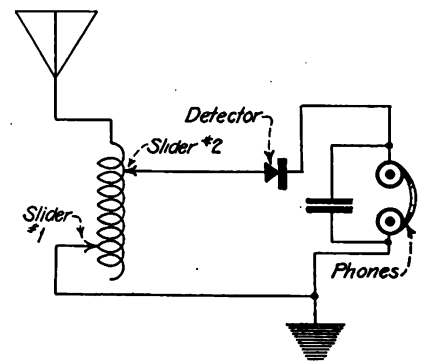
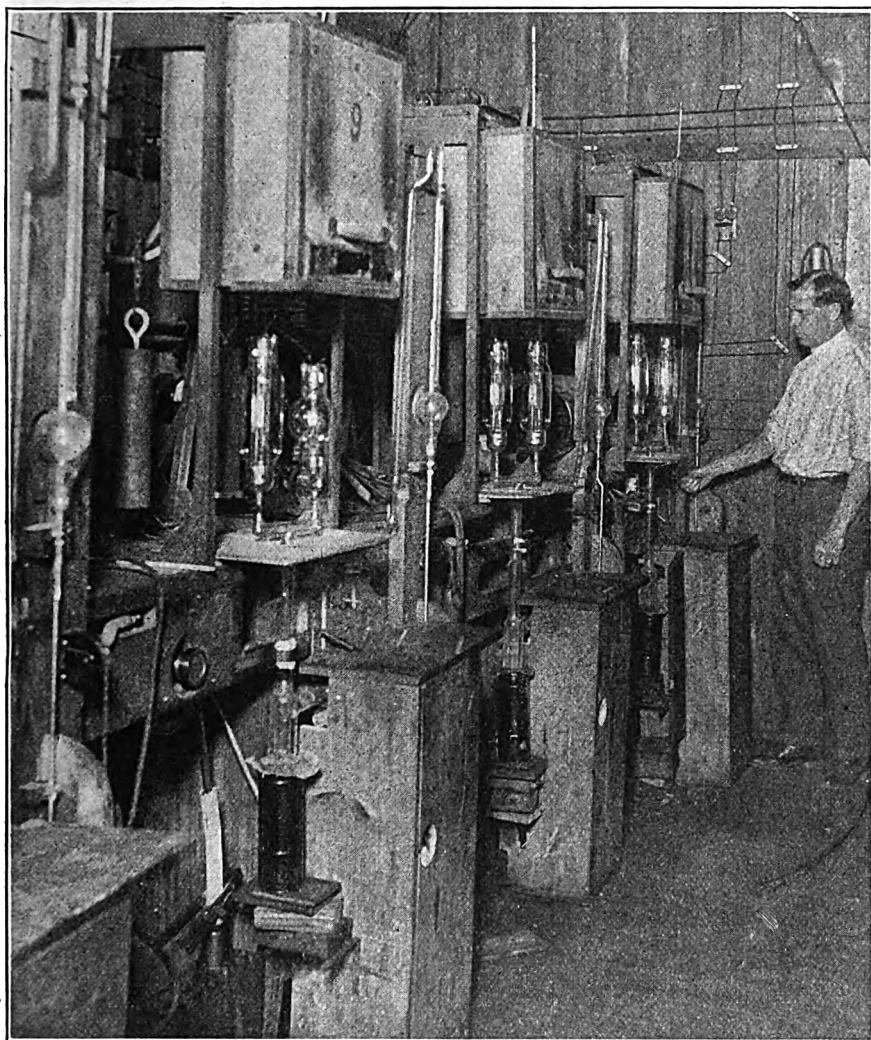


Figure 5.—Schematic diagram of the two-slide tuning coil. Suggested by George W. May. Drawn by S. Newman.

Where Vacuum Tubes Are Made



(c. Paul Thompson)

Radio has made such advance that, within a short period, it will be abreast with other manufactures. Every radiotelephone owner knows that one element of the receiver, in particular, makes radio possible. It amplifies the signal to such an extent that, without such an element, radiotelephony, probably, would be unheard of. This so-called element is the work of Dr. J. A. Fleming of Great Britain, and Dr. Lee DeForest, of the United States. It is known as the audion, or vacuum, tube. Such a tube requires skillful operation, and such skillful operation requires good workmanship. Radio, today, is undersupplied with such tubes, owing to the fact that only a certain number of manufacturers are allowed to make them. This limitation is due to patents; but, in view of all this, the electrical manufacturers are losing no time in turning them out in large quantities to supply the needs of the people. The photograph shows the workshop of a large factory where tubes are made.

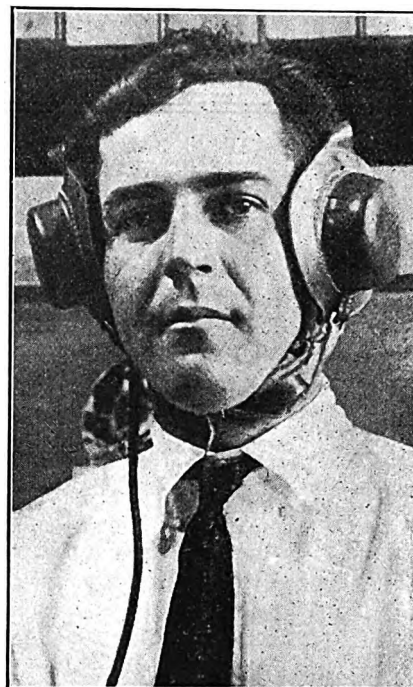
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vacuum-tube set when he gets one, as the tuning coil may be used later as a loading coil.

The construction of the tube is the same as the single-slide tuner, with the exception that the cardboard tubing should be about fifteen inches long. The longer the tube the more wire it will hold, and the more wire the higher the wave length to which the set will tune. Use the same size wire covering the entire tube; and, of course, shellacking, both inside and outside the tube before starting to wind, complete the construction as in the previous tuner.

With this advancement made, we have left the assembly of the slide rods and sliders.

Purchase two sliders and slide rods long enough to cover the length of the tube. Four binding posts will have to be purchased, also. Connect each wire end to one of the binding posts and, also, each slider. In order that the sliders may make contact, the wire must be scraped clean of insulation where the sliders are to work. This can be done by using a safety-razor blade or by burning it off with a soldering iron. Sandpaper may be used until the wire becomes shiny and makes good contact.

Radiophone Headgear Has No Mouthpiece



(c. Underwood & Underwood)

This is the latest device in radiophone headgear. It is worn by the operator at the new aerial lighthouse at College Point, Long Island, N. Y., the first beacon of its kind in the world. Note the apparatus beneath the operator's throat. It takes the place of an oral transmitter, picking up the vibrations of the vocal cords through the muscles and membranes of the throat.

Useful Things to Remember

That burning the filament too brightly merely wastes the filament and shortens the life of the tube without adding to the efficiency of the set.

That the best type of vacuum-tube receiving set is the regenerative with the amplifiers.

That the filament lighting does not always mean that the set is operating properly.

That a variable helps fine tuning.

That the distance you can receive depends upon various climatic and other conditions.

That if the filament rheostat is turned on suddenly the filament may be paralyzed and must be left to recuperate before it will glow.

That if there are too many turns of inductance they may be taken off to secure tuning.

That each step of amplification requires another tube.

That a vacuum tube or regenerative set may be amplified to almost any extent.

That an ordinary phonograph-horn attached to a head telephone-receiver will increase the seconds somewhat and will act as a loud speaker. That the ultra-audion circuit has the plate circuit led back to the honeycomb coil and amounts to a regenerative receiver.

That the filament battery of a vacuum-tube set may be a dry battery, but that it is more expensive in the end than a storage battery.

Radiograms

TWENTY AERIALS CROWNED THE ROOF OF THE 71ST REGIMENT ARMORY BUILDING, where the first radio show of New York City was held. They were constructed by Thomas F. Higgins, master signal-electrician of the 101st Signal Battalion. There was no interference between one and another because the aerials pointed in the direction of the broadcasting station. This problem Sergeant Higgins solved.

BROADCASTING IN EUROPE HAS ITS LIMITATIONS, according to Owen D. Young, chairman of the Radio Corporation of America, because many countries are suspicious that their neighbors will use the radiophone for propaganda purposes.

INTERNATIONAL PEACE WILL BE BETTER MAINTAINED BY RADIO is the news from Cannes where the four-power wireless conference between England, France, Germany, and the United States was held. Amenities between nations could be better preserved if there were continual conversation between them, and the best way to accomplish this is by radio.

THE USE OF THE MOST POWERFUL RADIO PLANT IN THE MIDDLE WEST, that of the Crosley Manufacturing Co., Cincinnati, (WLW) has been offered to the city authorities, by Powel Crosley, jr., president of the company, for the handling of vital municipal business.

THE FIRST USE OF RADIO BY THE VATICAN was the recent transmission to the United States of a message from Pope Pius XI, through Monseigneur F. Borgongini Duca, Papal Pro-Secretary of Extraordinary Ecclesiastical Affairs, to James A. Flaherty, of Philadelphia, supreme knight of the Knights of Columbus. The radio carried the formal approbation of Pope Pius of the Knights of Columbus million-dollar American welfare campaign in Italy.

"LISTENING IN" IS TO BE THE NAME OF A RADIO MUSICAL COMEDY. The words will be broadcast by Ed. Wynn, the comedian, and the music will be tuned in by various composers. Mr. Wynn promises wave lengths of fun, an ecstatic chorus, and anticipates a run without interference after the piece opens either in Philadelphia or New York.

FOR THE FIRST TIME, NAVIGATION ON THE GREAT LAKES HAS BEEN ROBBED OF ITS TERRORS. The first naval radio-compass station has been opened at White Fish Bay, Lake Superior, to direct passing vessels. Within two weeks, two more radio-compass stations will be opened: one at Grand Ma-

raias, sixty miles west of White Fish Bay, the other at Detour, at the mouth of St. Mary's River. This section is known as the "Graveyard of the Lakes."

CALIFORNIA LEADS ALL OTHER STATES IN BROADCASTING, Ohio holds second place, and Pennsylvania and New York are about tied for third, according to a bulletin on the geography of radio broadcasting issued by the National Geographic Society, Washington, D. C.

IN ORDER TO GIVE FIREMEN THE BENEFITS OF RADIO as it is broadcast from Newark and other stations, Thomas J. Drennan, fire commissioner of New York City, has given his sanction to the installation of receiving sets in the engine houses of the department. Mr. Drennan points out that it will furnish diversion and healthy recreation for the men, and break the monotony of their lives. The sets are to be installed at the expense of the men.

"RADIO INDICATES THAT WE MUST USE AN INTERNATIONAL LANGUAGE," says Professor A. Cristen, in an interview in the New York "World." "For hundreds of years people have wanted a universal language. They wanted it when it took three months to cross the Atlantic. They wanted it when there was no telephone or telegraph. How much more do they want it now that they have radio? Radio has clinched the matter." Professor Cristen is a celebrated linguist. In his opinion, the international language will be Esperanto.

"THE BLIND MAN NOW HAS THE ADVANTAGE OF CURRENT NEWS," says Charles E. Comstock, of the State Department of Public Welfare of Illinois. "Radio has made it possible for the sightless person to receive news daily without having it read to him." Mr. Comstock has been blind from infancy.

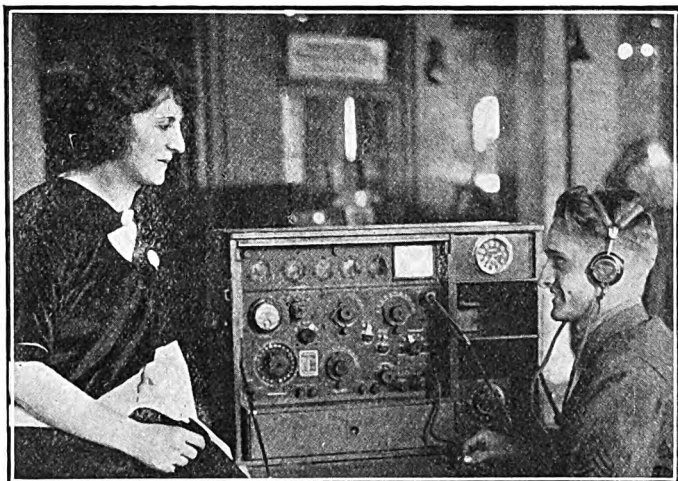
THE NINETEEN AMBULANCE DRIVERS OF BELLEVUE HOSPITAL, New York, now have a receiving station to entertain them during their idle hours.

CONEY ISLAND WILL HAVE A PERMANENT EXHIBITION this summer. The Radio Exhibitions, Inc., announce this as one of the attractions at the famous resort. One of the items of the daily program will be the "Trouble Counter" where amateurs may consult experts.

REMARKABLE PIONEER WORK IN RADIO IMPROVEMENT is being done by the United States Air Mail Service, despite the fact that Congress has been extremely slow in granting appropriations for that important service. The A. M. S., is laying the foundation for air transport that will revolutionize physical communication in this country.

THE WORK OF PREPARING AND INSTALLING RADIO FOR THE BLIND CITIZENS of the State of Michigan has been undertaken by Lieutenant Leon Seely of the Michigan Employment Institution for the Blind, at Saginaw.

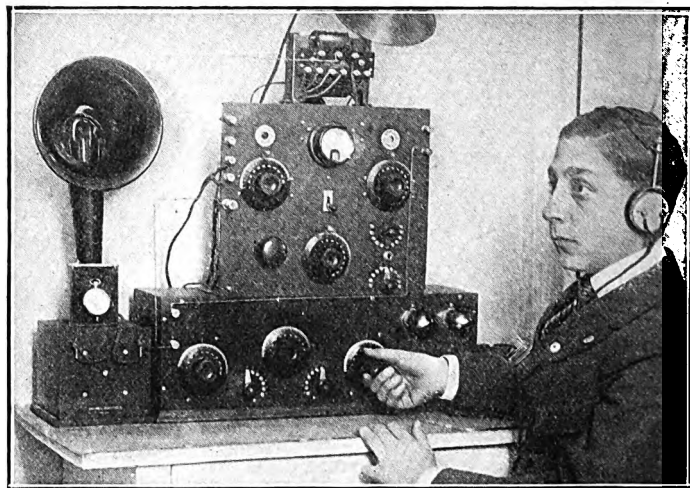
How the Army Does It



(c. Kadel & Herbert News Service)

Sergeant Harry Elliott, of the United States Signal Corps, explaining to Miss Eleanor Sebrott, amateur radio operator, the working of the Army's long-distance radio set.

A New York Boy's Set



(c. Kadel & Herbert News Service)

Robert Koerner, a youthful enthusiast, and his compact radio set. Many New York boys have similar sets, for receiving over the ether is highly popular with them.

Radio World's Hall of Fame



JOHN V. L. HOGAN

Mr. Hogan is one of the most experienced workers in the radio field from its early days; an organizer and past president of the Institute of Radio Engineers; patentee of many radio inventions, including the single-variable tuner, the balanced antenna for static reduction, the detector-heterodyne receiver, and others; a pioneer in radiotelephone broadcasting; author of numerous scientific and educational papers and articles; formerly chief research engineer of the National Electric Company, and manager of the International Radio Telegraph Company; now practicing in New York as consultant in engineering and patent matters, and specializing in radio.

How to Filter Atmospheric Conditions

By C. White

STATIC disturbances are common radio pests, especially at this time of the year and throughout the summer. In tropical countries, these disturbances reach such a magnitude at certain times that the operation of small radio-stations is practically impossible, while larger stations having a normal range of over a thousand miles are actually cut down below two hundred and, often less. Much money and time have been spent in scientific research to devise a means for completely and effectively eliminating static; but, as yet, no simple and practical scheme has been discovered.

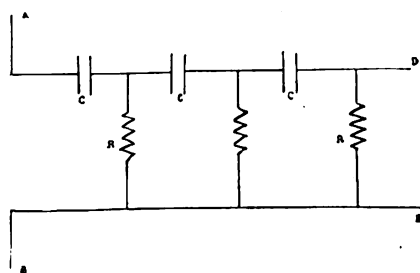


Figure 1.—An aperiodic filter. C, a capacity of .0005 microfarads. R, a resistance of 50,000 ohms. A, B, D, E, are terminals.

One might ask in regard to the actual nature of an atmospheric discharge, whether it is aperiodic or periodic. An aperiodic discharge is one in which the discharge current does not oscillate, while a periodic discharge is one of an oscillatory nature. Static is invariably of the latter type, the charges oscillate very rapidly between earth and cloud, with a frequency that is solely dependent on the relative inductance and capacity between these two. Hence the frequency of the discharge will vary according to the height of the cloud and the electrical constants of the path to ground.

Static can not be completely eliminated, but it certainly can be minimized by the use of a well-designed filter circuit. To the unsuspecting amateur, an electrical filter may mean very little, but to the man accomplished in the art of wired telegraphy and telephony, it is a very great help. An electrical filter-circuit does the same thing, theoretically, that a mechanical filter does with impure water. It weeds out the undesired and dangerous matter. The general purpose of filters, in amateur radio work, may be outlined in two parts; first, to prevent all signals except the desired one from being amplified and detected;

and, second, to prevent stray currents due to static discharges from passing to an operator's phones. Filters aid very materially in accomplishing these two purposes, although by no means do they form a complete and thoroughly satisfactory solution to the problem.

A filter can be defined as an electrical circuit consisting of some combination of resistances, inductances, and capacities. Those filters composed of circuits containing only resistances and capacities, or resistances and inductances, are called aperiodic filters; that is, they are not tuned to any frequency; while those filters composed of inductances and capacities are periodic, or, in other words, tuned to some definite frequency. The complete design of an aperiodic circuit is an involved mathematical problem, requiring mathematics of a high degree; but the design of a periodic circuit is quite simple, requiring little or no figuring at all. Therefore, I shall show only a type of an aperiodic filter.

In Figure 1 is illustrated a common design of a small aperiodic filter-circuit for radio work. Such a filter can be made up of fixed condensers having a capacity of .0005 microfarads and resistances of 50,000 ohms apiece. Of course, the hitch in the actual construction of such an affair is the 50,-

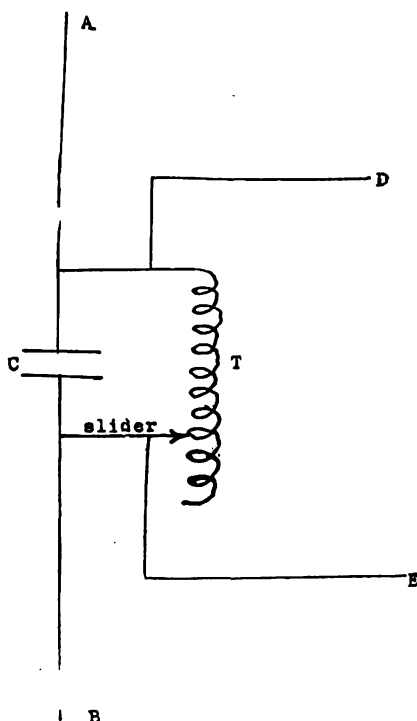


Figure 2.—A periodic filter. C, a capacity of .001 microfarads. T, a simple tuning coil. A, B, D, E, are terminals.

000-ohm resistances, which may not be readily obtainable.

But for those who do not feel inclined to go to the trouble and expense to build a filter of the aperiodic style, a more simple and economic type is shown in Figure 2. The circuit there illustrated is one for a periodic, or tuned, filter. This type of filter can be inexpensively constructed with one fixed condenser of .001 microfarads and a simple slider tuning coil, with a total cost not exceeding \$4. The virtue in such a circuit (Figure 2) lies in the fact that if it be tuned to the frequency of the incoming signal it will practically conduct

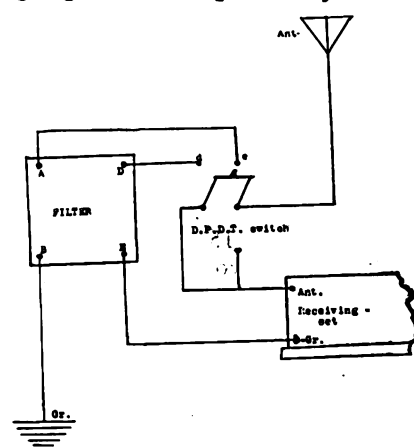


Figure 3.—Filter and receiving set connections.

none of the current of that frequency, while for currents of all other frequencies it will act as a short circuit to ground, thus forming a better path to ground for the static discharge than the receiving set. It is obvious that all of the static or stray current will not pass through the filter.

A filter should be shunted—that is, connected in parallel, across the receiving set, as shown in Figure 3. To adjust the filter, it is necessary to tune it, if it be of the periodic type (Figure 2). This is best accomplished by removing the filter from the receiving set and tuning the receiving set alone. Then the filter may be placed in the circuit and the slider on the tuning moved until the maximum signal is heard in the phones. Practically no further adjustment is necessary unless it is desired to receive a signal of a different wave length, then the operation will have to be repeated. A filter of this type will not satisfactorily function when receiving from spark stations; it is primarily intended only for C. W., where the carrier-wave frequency is fixed.

New York's Third Radio Show a Hit!

NEW YORK'S third big radio show is over.

The 71st Armory never held a more exciting affair.

The attendance, large at the opening, increased throughout the week.

Saturday night, the closing night, saw the largest crowd. The Radio Corps—all smartly uniformed young "fans"—did the policing and did it well.

Rudolph Knopp, of Cedar Grove, N. J., was awarded the first prize in gold for the best radio receiving set.

As usual there was immense interest displayed in the Army and Navy exhibits. The government appliances won great admiration.

Then there was the giant Naval compass loaned particularly for this occasion by Secretary Denby. Everyone wanted to see how it worked, and everyone was told by an efficient officer.

The singing of Miss Hope Hampton was greatly enjoyed. Hers is a voice that blends with radio as sunshine blends with smiles.

A. Falske, of 1515 Eastern Parkway, Brooklyn, won the second prize of \$75 for the best receiving set. The third prize, \$50, went to F. B. and Walter Ospan, of Ridgewood, N. J.

Elmer Tripp had a very busy booth. He answered questions that were hurled at him with remarkable alertness. His knowledge of radio is something remarkable.

Much credit goes to Mr. Buchagani, the managing director, who made the show a success. His press work was handled with all the skill of his newspaper training.

There is to be another show at the 71st Regiment Armory some time early in the fall, it is said. The quickness with which radio equipment is changing and improving demands this.

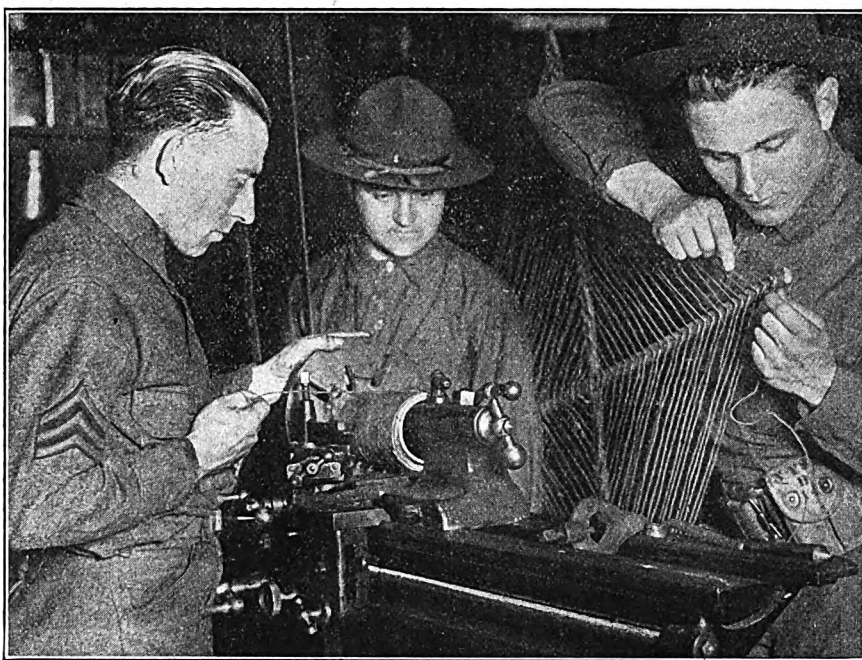
There were a great many speakers—men who told about the wonders of radio—and none exaggerated the marvel of the age. These speakers had many listeners at all hours.

Radio Club Notes

THE secretaries of the following radio organizations have filed the names of their clubs with RADIO WORLD. All other clubs are invited to send in their names and addresses, and the name of the officer to whom membership application should be made:

Glenwood Radio Club, 322 Warburton Ave., Yonkers, N. Y.

Polytechnic Radio Association, of the Baltimore Polytechnic Institute, Vincent E. Powers, Jr., president, 1715 Guildford Ave., Baltimore, Md.



(c. Kadel & Herbert News Service)

One of the many new features exhibited at the New York Radio Show held in the 71st Armory. A member of the 101st Signal Battalion is describing a tuning coil. The corporal at the right is constructing a hook aerial.

Radio Club, Bay Ridge, N. Y. meets at the South Brooklyn Branch Public Library, Wednesday at 7:30 P.M. No qualifications necessary to become a member.

The past several meetings of the Radio Club of Brooklyn have been marked by large attendances. The meetings, held Thursday evenings, were taken up by the reading of papers by club members on current radio topics. "The Radio Log," issued monthly by the club, appeals for a general education of the public in radio.

The Eighth Ward Radio Club which was organized with only four charter members is, to-day, one of the most ambitious radio clubs in New York in point

of membership and activity. The club has no permanent quarters as yet, but a neighborhood community house has promised to give it ample meeting space next fall. All communications, for the present, should be addressed to Martin Remneck, 147 Avenue B, New York City.

All of the policing and ushering at the Radio Show which closed at the 71st Regiment Armory, May 27, was done by the Radio Cadet Corps. The corps has completed plans whereby hikes and weekly camping trips will be a feature of its summer programs. In addition to recreation and drill, radio will be put to practical use out of doors.

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Radio and the Woman

Latest Gossip About the Feminine Enthusiasts

AN assurance of safety to women is conveyed to us in the announcement that patrol automobiles of the New York Police Department are to be equipped with radiophone apparatus. The assurance also contains a warning note to the fair motorist who, too long and too often, presses that piece of steel so conveniently set 'neath her pointed shoe.

* * *

Miss Jeanette Vreeland is the first vocalist to give a song recital from an airplane. The recital was transmitted by a 50-watt set on a 507-meter wave length with a range of 500 miles.

* * *

Lourence Stephenson, radio fan, sends me this:

When theories new to us are brought,
We're prone to sneer and ruff our hair
And straightaway, without giving thought,
Exclaim, "Aw! Give that the air!"
But now that classic phrase has won
Distinction high and rare,
For man soon learned what could be done
When, for his own, he took the air.
He rules it now with ruthless hand,
The world is his and he is king;
He listens in at Hindustan,
Or hears a glorious artist sing.
If he is traveling o'er the land,
At stocks he still can have a fling:
Radio's magic at his demand,
Knowledge, power, and pleasure bring.
Politeness now we don't impair,
When we advise — "Go take the air!"

* * *

The Weather Man, not quite satisfied with the excellent service he has been rendering housewives, is now letting us know in advance just what day to arrange for the laundry maid.

* * *

Queen Victoria Eugenie, of Spain, has evinced considerable interest in wireless.

* * *

The Parasol—that utterly feminine accessory which has not been strongly in vogue for a number of years—will undoubtedly come into its own, now that it can be used as a radio-receiving apparatus.

* * *

Do you know that a Miss A. G. Parker was a real honest-to-goodness ship-operator on the steamer "Mohawk" of the American Line?

* * *

A hair-dressing parlor in New York now advertises "The Radio Wave."

* * *

Members of the League of American Penwomen "taxied" and "subwayed" to the National Arts Club in expectation of hearing the authoress of "The Man in the Moon" stories re-

late how she gathers her material and how she came to write the tales. Though disappointment followed hard on the heels of the announcement that so honored a radio guest was not to be among the speakers, a sympathetic understanding was expressed for the shyness which prevented her attendance.

* * *

Instead of asking the oft-repeated question, "What receiving set shall I buy?" Mrs. Agnes V. Miller, of Newark, simply turned to and made one. At a recent radio meeting at the National Arts Club, New York City, at which Mrs. Miller lectured, she referred to WJZ with such possessive affection and pride that a writer sitting beside me questioned: "Who is W. J. Z.? Must be a relation of hers?"

* * *

A southern maid, obviously affianced, writes to ask if her solitaire ring, when worn while she operates her transmitting set, is likely to distort radio waves. Now, don't you reckon

that she's just gone and got electric currents all mentally confused with heart throbs?

* * *

Major-General George O. Squier's idea of making every lamp-socket a radiophone draws a complaining wail from a fair radio fan who bemoans the possible loss of keen pleasure derived from tuning in on a wave length. "How much more fun it is to twirl a dial," she says, "than to just plug in on a lamp socket!"

* * *

A humorous suspicion occupies the minds of certain manufacturers that members of the gentler sex are transmitting under operator licenses issued to husband or brother.

* * *

Word comes from abroad that women's interest in radio may prompt foreign costumers to decree hoop skirts as a fashionable mode of inducance.

* * *

A woman friend, the owner of a receiving set, who has hitherto dreaded the terrorizing effects of summer thunder storms, is taking comfort in the well-known fact—insurance companies' statements to the contrary—that there is not a single proven case of an antenna attracting lightning.



(c. Underwood & Underwood)

Radio enthusiasts, as well as the advanced amateur, have tuned their receivers, many times to 1,450 meters, to listen to the concerts, rendered by the Army radio station, located at Fort Wood, Bedloe's Island, N. Y. This station can be better identified by its call letters WVP. This photograph shows the interior of the station, where the artists appear to broadcast their musical selections. The phonotron can be seen, in which capacity every minute vibration is carried to the radio transmitter for transmission. Mrs. Morin Scott Hare is singing Rabey's "Tes Yeux," violin obbligato, by Mrs. Henry Murdock Ward, with James Caskey at the piano.

It had proved to be a tiresome, all-day trip and the railroad train was hot and stuffy. The mother, who had ineffectually struggled with her small son, who shifted and climbed about restlessly, cast a despairing look at the woman who occupied a seat across the aisle.

"He's so tired. I don't know what on earth to do to keep him still," the mother remarked, referring to the boy, "and it'll be another hour before we reach Newark!"

The other woman had noted the mother's desperate efforts to restrain the twisting child and now said impulsively: "Let me take him. I know a number of bedtime stories. Perhaps they will keep him quiet."

A minute later the child was in the woman's arms and was regarding her with the usual childlike wonder. Holding the chubby little figure close, she started in to do her best to interest her small audience in the stock of stories at her command. In the seat opposite, the tired mother relaxed.

Miles and time flew on swift wings until the mother again interrupted: "We're nearing my station," she said, "I'll take Johnny now. It was awfully good of you to amuse him."

The woman extended the child, from whose face had disappeared the petulant frown and whose blue eyes were content and shining. Her own face held a queer look.

"Not good of me at all," she said, "any indebtedness is really on my side. You see," she explained. "I'm one of the performers who broadcast bedtime stories by radio. I've so often wondered if children really like them; and until I related them to Johnny, I never could actually know how kiddies look when I talk through the disc to them. His joy has meant a great deal to me; his face is a memory I shall keep with me—always!"

* * *

Women will unquestionably be greatly benefitted by the series of instructive lectures which the radio department of Tufts College, Massachusetts, are to broadcast twice a week. The subjects of these lectures are to cover an almost boundless field of human knowledge. Of particular interest is the announcement that lectures bearing on topics which will interest the women at home, will be broadcasted afternoons and will be delivered in a way in which notes can be taken, if desired. This, in my opinion, is one of the most interesting things that is being done for women in wireless. It is bound to be of immense educational value to our sex.

The broadcasting will be sent out from the Amrad Transmitting Station at Medford Hillside, Mass.



(c. Underwood & Underwood)

Not only are women learning the art of radio communication, but are becoming so familiar with the various types of equipment, that the householder will be surprised to find her own sex demonstrating the mechanism of a radiophone receiver. The Misses Mary J. Grady and Alice Donovan, in the above photograph, are demonstrating a complete radiotelephone receiver. Miss Grady has control of the radio key by which messages may be transmitted, while Miss Donovan is in the position to transmit a wireless-telephone message. Of course, it must be understood, both cannot operate at the same time.

Slender, dark-eyed Edna Hirshfield, promising girl student among those taking the wireless course at the Radio Institute of America, spiritedly contradicts all masculine statements which infer that women in general appear dazed when technical terms are mentioned and stand in fearsome awe of the mechanics of radio.

"Before taking up this course, I never knew a thing about mechanics of any sort!" Miss Hirshfield exclaimed. "Nor are any members of my family mechanically inclined. My interest in radio dates from the time I first obtained a receiving set. The instrument simply fascinated me until I felt that nothing was more to be desired than a deeper knowledge of a subject that calls for more intelligence than merely tuning in on a wave length. I seem to be getting on very well in my studies here, and when I have obtained a first-class operator's license, I hope to make my living in this calling."

Then, because Miss Hirshfield is too shy and retiring to talk very much about herself, R. L. Duncan, director of the institute, laid emphasis on the splendid progress she has made, stating that her code speed for the length of time she has been at the institute exceeds that of the average pupil, and that the mechanics of radio are easily understood by her.

To master from fifteen to eighteen words a minute, after taking the course for only three months, is a pretty good stunt for even the average student who gives the majority of her time to it; but to have acquired this record when able to give her attention to wireless only when she can snatch time from her regular daily occupation of bookkeeper—and then only at the end of a day when physical strength and vitality is at a low ebb—is something of which anyone may be proud.

Yet Miss Hirshfield makes little comment on the success of her present efforts. She merely reiterates that tired nerves and the possibility of overtaxing a delicate physique are not written in on the vitalizing pages of radio, which reveals fresh, new lines of thought, upon which thousands of women are too busy expending their wits to dwell on imaginary things.

* * *

A certain mineralogist is working on a radio invention that will detect minerals underground.

* * *

Classified advertisements for radio salesmen are appearing in daily newspapers? Why not saleswomen?

* * *

A radiophone has filled the need of a temporarily vacant church pulpit in New England.

The Radio Primer

A. B. C. for the Beginner Who Must Have the Facts Put Plainly and Tersely, and all Terms Fully Explained

The Beginner's Catechism

By Edward Linwood

WHAT is meant by amplification?

Amplification means to magnify or enlarge. In radio, it refers to the magnification of the strength or loudness of the signals received and detected.

* * *

How are the detected signals amplified?

By the use of additional vacuum-tubes. Instead of inserting the head phones in the output, or plate circuit, of the detector tube, the currents in this circuit are passed into a special transformer, called an "amplifying transformer," which increases the potential or voltage. After passing through this transformer, the signals are lead to the grid of an amplifying tube. Being of greater potential when they enter the tube through the grid, these currents liberate a large plate-current. Thus, if the head phones instead of being inserted in the detector plate-circuit are inserted in the amplified plate-circuit the signals, as heard, will be many times louder—perhaps 100 times.

* * *

How many times can these detected signals be amplified?

Experimentally, without limit; but, practically, the strengthening of the signals is limited to two amplifying tubes.

* * *

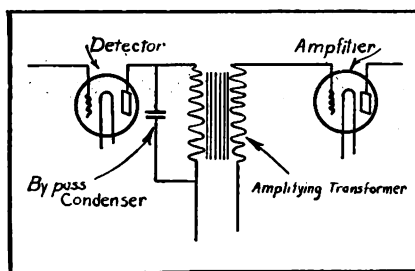
What limits the number of tubes?

The skill of the operator in most instances. It should be remembered that the amplifying tubes are not selective. They amplify any impulses that are fed to it. Static, strays, tube noises, magnetic-coupling noises, battery gassing—these are only a few of the sources which generate sound in a radio outfit. And the amplifier will take each and every one of these foreign sounds and give it the same magnification it gives the signals.

* * *

How much additional equipment is needed for each stage of amplification?

Amplifying transformer, tube, rhe-



Schematic diagram showing how radio-frequency currents are shunted around primary windings of amplifying transformer.

ostat, high voltage B battery and telephone jack.

* * *

Can amplifiers be used with regenerative circuits?

Yes, but it will be found advantageous to insert a small by-pass condenser around the primary winding of the first transformer.

* * *

What is the reason for this condenser?

The high-frequency resistance or impedance of the transformer winding is so great as to form a barrier against the passage of the retuned currents. A condenser allows the high frequency, or as they are more often called the "radio frequency" currents to pass around to the grid without encountering this barrier.

* * *

What is the voltage of the high-tension B Battery used in the plate circuits of amplifiers?

It is usually about 45 volts, or twice that of the detector tube battery, although under certain conditions this voltage is raised to 60 or even to 90.

The Radio Primer has been published regularly in RADIO WORLD since issue No 1, and will be a regular department in order to instruct and aid the many thousands of amateurs who are joining the ranks of radio enthusiasts every week.

Why is a different voltage required here?

Because it is necessary that the tube be adjusted so that the signals are strengthened without being distorted. Different makes of tubes have different characteristics; that is, they react differently to the same conditions of grid and plate voltages. To obtain perfect amplification, it is essential that the voltage of the plate be maintained normally at a given point so that, as signals arrive, they are magnified exactly proportional to their original intensity. This can be explained by the following example in which the values have been assumed without any relation to their correctness: (See schematic diagram.)

Suppose a tube were designed for a plate voltage of 45, and, when thus connected, magnified all incoming signals seven times. If a signal appeared on the grid having a potential strength of one volt, the resulting amplified signal would be the equivalent of seven volts. An incoming signal of three volts, potential, would be increased to twenty-one volts. Everything would be proportional and there would be no distortion.

But suppose, again, that the plate potential were increased to fifty which is five volts more than is necessary. When a signal strength of one volt appeared at the grid the seven volts would be at the terminals of the head phones in the plate circuit. So far so good. But along comes a signal with strength of three volts and then, due to the too large potential on the plate, the magnified potential is not seven times three or twenty-one as in the former case but only six times three or eighteen. The magnification has not been proportional and the result is distortion. This factor may not be so important in receiving spark-stations but in broadcast reception it is all important.

* * *

It is said that a pencil mark across the condenser terminals will make a good leak. Is this true?

Yes, provided a good connection is made between the pencil mark and the terminals. Altogether too often the mark is carefully traced down the length of the condenser and left incomplete at the terminals. The path of a discharge across a pencil-line grid leak may be likened to a journey of a man across a river filled with broken ice cakes. If the cakes are not too far apart, he can leap from one to another; but, if the last cake is fifteen feet from the shore, it might as well be fifty feet. If a pencil line is used as a grid leak, be certain that the line hooks up well with the connections at the ends.

The Messenger Boys of Broadcasting

By E. L. Bragdon

CARRIER waves, stripped of all their technical verbiage, are the impersonal means which owners of broadcasting stations use to deliver their program messages. Like the telegraph messenger boy, carrier waves have no particular connection with, or interest in, the message they are bearing between the sender and receiver. They are brought in the limelight for a specific purpose and no one cares where they meander after the message they carry has been delivered.

When one person lifts the receiver from an ordinary telephone and talks with another person three thousand miles away, the copper wire forms

If a battery containing a sufficient number of cells to bring the voltage up to, say, 300 is connected in the plate circuit of a vacuum tube, and coupled in some one of many ways to the grid circuit of the same tube, the condenser and inductance action of the tube circuit will start the tube to vibrating. The number of the vibrations will depend on the value of the condensers and inductances in these circuits.

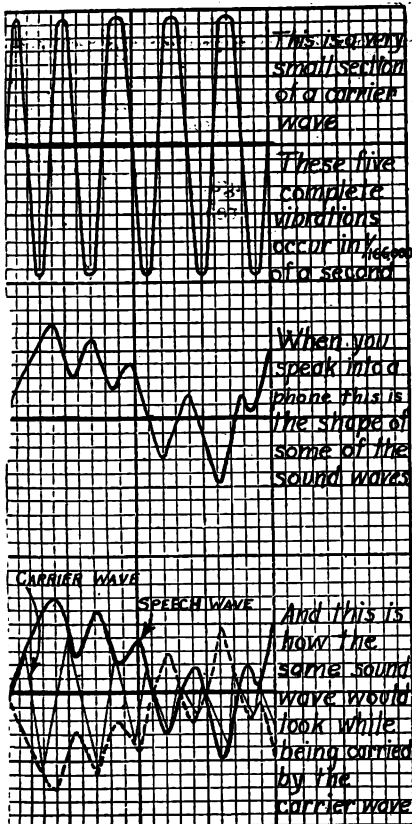
Once started, the vibrations of the tube will continue as long as the energy is supplied to the plate and instead of alternately increasing and decreasing as in the case of spark discharges the waves will be continuous and equal in magnitude. If the circuit is tuned for 360 meters, there will be 833,000 of these oscillations every second. This series of waves sent out from the transmitting station is the carrier wave.

Because the carrier wave is of such high frequency it can pass through the air without causing trouble. Its rate is about one hundred times too fast for the most sensitive human ear.

But this fact, instead of being a detriment, acts as the savior of the situation.

Whatever is sent out from a broadcasting station, be it song, musical or plain speech, the vibrations are only what can be understood by the listener. So what should be more natural than to place the voice vibrations astride the fast-moving carrier wave and have it taken to the destination? At the latter place, if desired, the voice vibrations can be removed and the carrier wave allowed to pass on. That is exactly what happens.

Another picture of the combination of carrier and voice waves is seen in a monster Zeppelin. When viewed from the outside, there is no suggestion of network within. Yet the envelope which stretches, cigar shape, several hundred feet from stem to stern, is supported on the inside by a series of wire girders always pressing outward. In the same way, the carrier wave gets underneath the voice vibrations and supports them as they travel through the air to the various receiving stations.



Schematic diagram showing carrier waves.

the path for the speech impulses. The carrier wave of radiotelephony corresponds to the carrier wire of wired telephony.

Although carrier waves can be generated by several widely varying types of equipment, such as the high-frequency generator, the arc, and the quenched spark, only the vacuum tube is employed for this purpose by American broadcasting stations. For the sake of simplicity, this paper will be limited to the tube.

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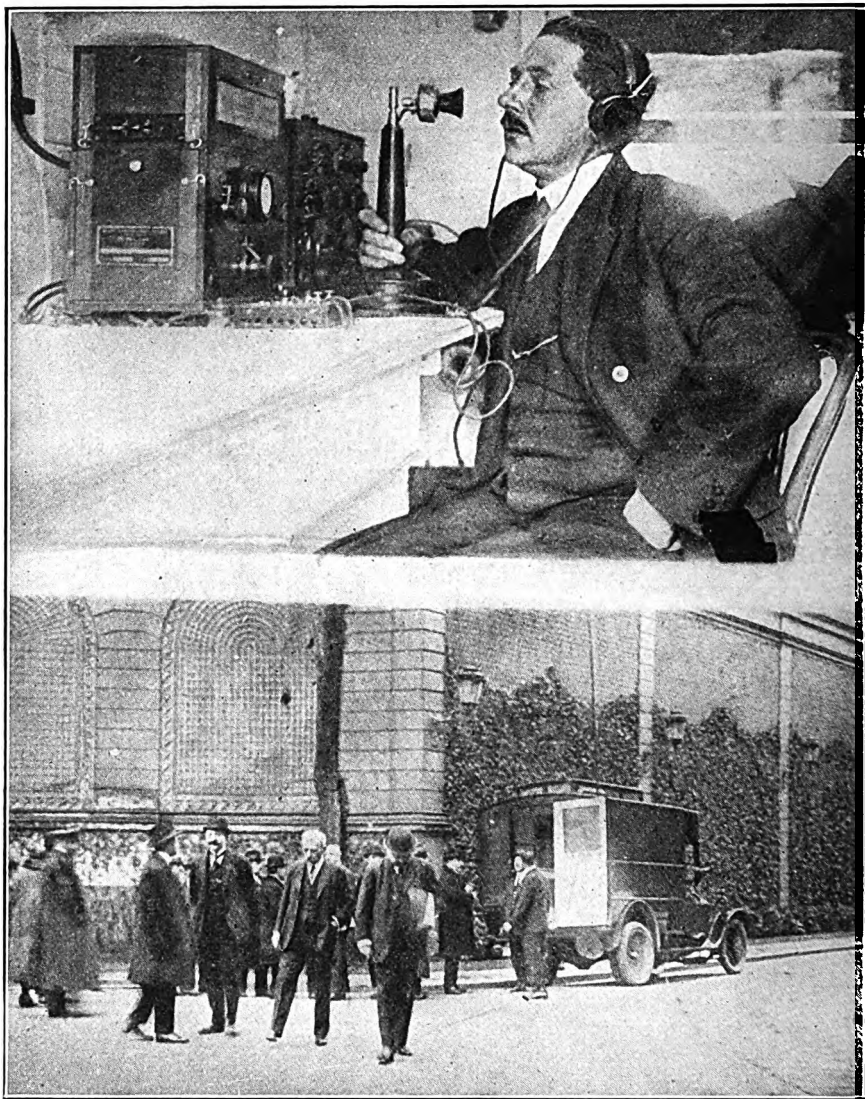
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While every possible care is taken to state correctly matters of fact and opinion in technical and general writings covering the radio field, and every line printed is gone over with a scrupulous regard for the facts, the publisher hereby disclaims any responsibility for statements regarding questions of patents, priority of claims, the proper working out of technical problems, or other matters that may be printed in good faith and on information furnished by those supposed to be trustworthy. This statement is made in good faith and to save time and controversy over matters which the publisher cannot possibly have control.

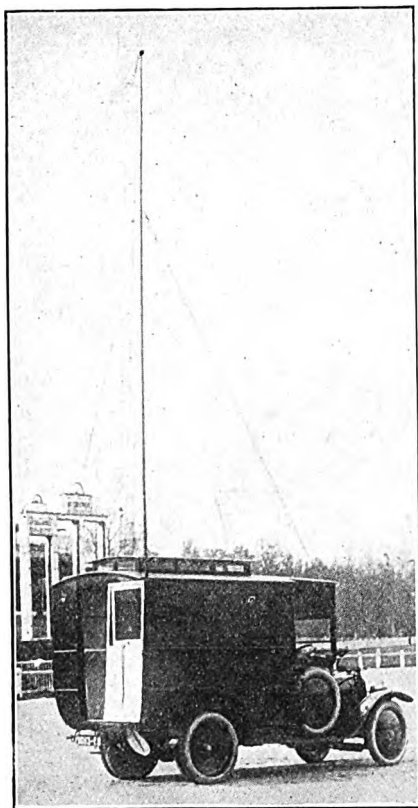
Invisible Net of Radio Bags France's Fleeing Crooks

THE world has heard of the radiotelephone being used in many homes where concerts, music, and speech were received through the ether—coming for many miles. If a receiving station were to be erected with ample instruments these signals could be received just as they were being transmitted, provided one tuned in on the proper wave-length. The police department of Paris, France, used this exact idea, but on principles whereby radio communication would benefit the department when quick action was needed. A radiotelephone transmitter was installed in a central location, possibly police headquarters, which worked on a set wave-length. The motor-cars representing the various units of the department were fitted out with antennas and receiving gear. With all this equipment on hand, it should indicate what quick action could be taken in case of disturbance, or riot, or gathering in a fleeing crook. Instantly, the moment the message is broadcast, every police car would have it, and the police could speed to their call and quell the disturbance.



(c. Kadel & Herbert News Service)

Paris has inaugurated its first wireless-police patrol. This special telephone truck, while en route to the scene of a crime, may keep in touch with the prefect of police, or even with an airplane tracking a criminal. Its worth was demonstrated in the presence of M. Leuillier, prefect of police, and M. Guichard, chief of the Paris police. The upper photograph shows the radio operator in his cabin in the radiotelephone truck. The lower, the truck and the non-conducting carpet on which it is run when a stop is made, so distant conversation may not be interrupted.



(c. Wide World Photos).

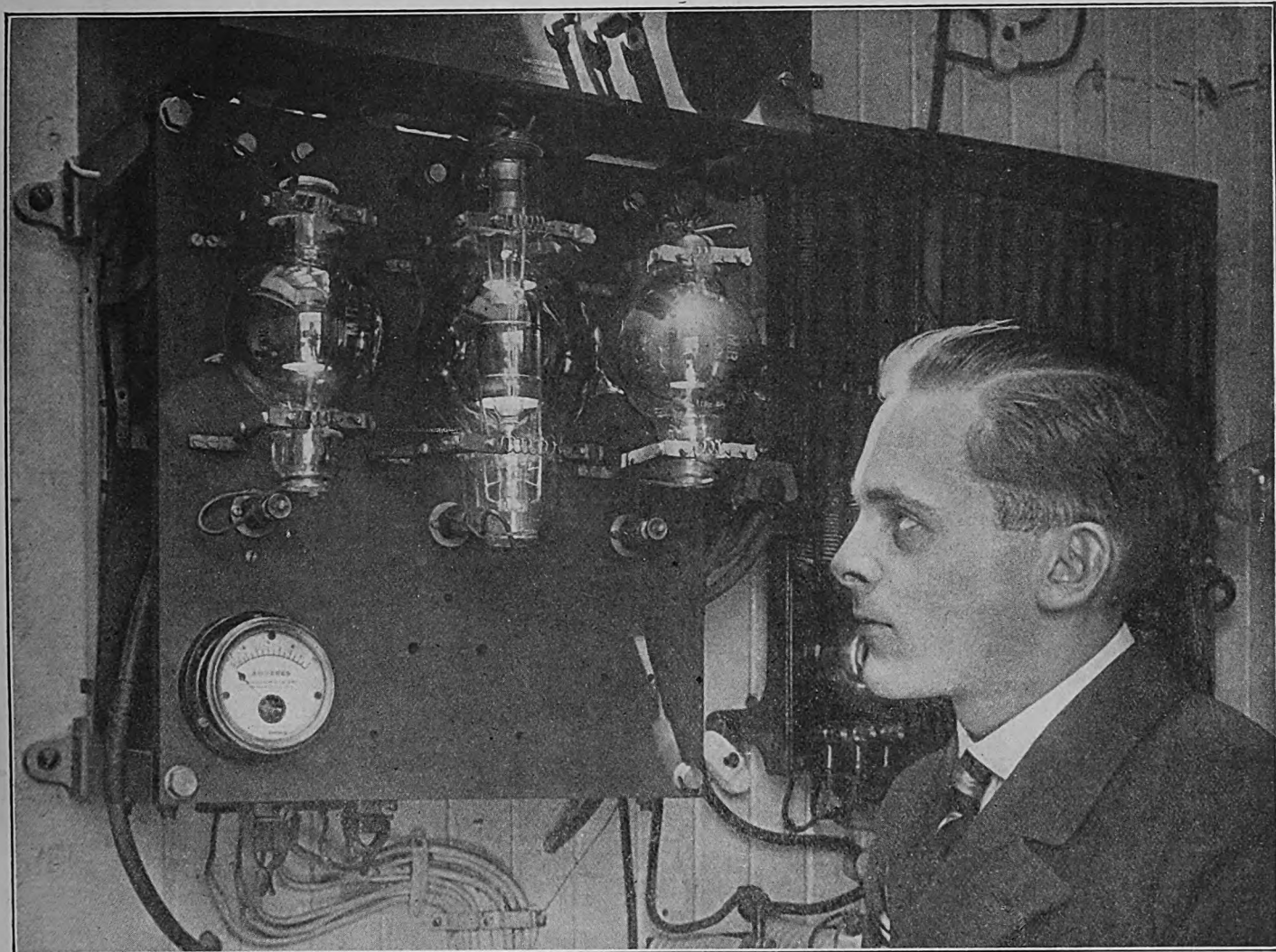
A motor-car of the Paris police, equipped with radiotelephone, constantly in touch with the office of the prefect of police.

Important to Vacuum Tube Users

USERS of vacuum tubes are unaware that they must unintentionally cause as much interference as if they were operating transmitting stations. The cause of this trouble is due to the application of too high a plate, or B battery, and forcing the tube by an excess amount of filament of A battery. The tube when so operated acts as a transmitter, and, by means of oscillations

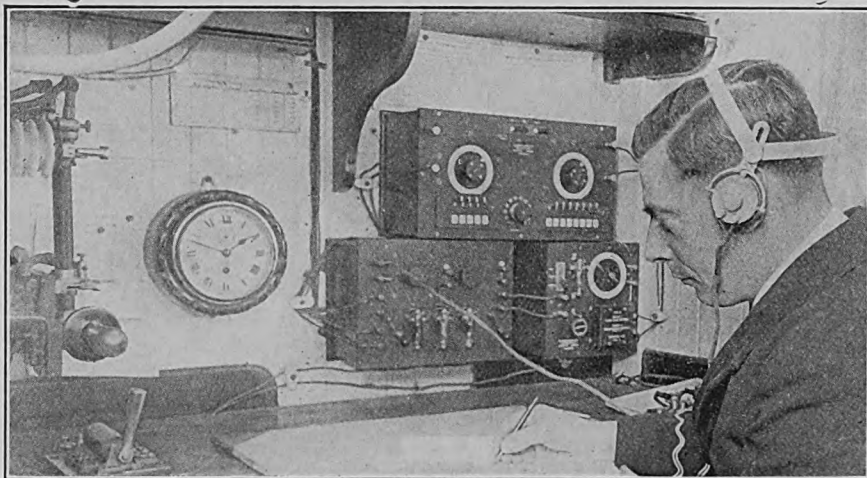
which it sets up, will retransmit signals received on a given wave-length. The change in adjustment of the receiving set will change the wave length sent out, and much interference is caused to other listeners. "Heterodyning," as this is called, is becoming a serious matter and can be eliminated if vacuum tube users will watch the voltages carefully. This is an important factor with tubes.

Far-Flinging Sound Transmitters Keep Ships in Touch with Shore



(c. Ewing Galloway, N. Y.)

By this transmitting apparatus, part of the equipment of the Lamport & Holt liner "Vauban," the big steamer, when 1,500 miles at sea, is able to keep in communication with shore. She operates a modern valve, or tube, transmitter which requires only one $\frac{1}{2}$ k. w., of current. Such an equipment enables ships crossing the Atlantic to communicate with either America or Europe continuously. The capacity of the instrument with so little current is accounted for by a very carefully adjusted aerial. The "Vauban" has one of the best wireless outfits on the seven seas. Her main receiving instrument registered distinctly messages from the Conte Radio Station in the Philippines, when 11,500 miles away—nearly half way round the world. The "Vauban" is also equipped with the latest-type Marconi direction finder which determines the direction of messages coming from shore stations and, thereby, ascertains the exact location of the ship when she is enveloped by fog. It will not be long before every deep-sea steamer will be as well-equipped with radio as is the "Vauban." No other element in science or invention has done so much to safeguard the lives of ocean travelers.



(c. Ewing Galloway, N. Y.)

F. W. Walsh, chief wireless operator of the liner "Vauban," and the apparatus whereby he receives messages. This is the very receiver through which came the message from the Philippine Island 11,500 miles away. It is one of the best adjusted receivers in maritime use. The Philippine message was picked up while the "Vauban" was en route from Buenos Aires to New York. While in the harbor of Buenos Aires, the "Vauban" caught messages sent out by the Leaffield Radio of Oxford, England. The photograph shows only a little corner of a big liner, but, perhaps, the most important corner in the ship.

Radio Merchandising

Trade Notes

THE AIR-O-PHONE CORPORATION of 122 Fifth Avenue, New York City, manufacturers of the Air-o-phone, has completed an amalgamation with the National Phonograph Company of Canton, Pa. Under the new arrangement, Air-o-phones will be manufactured and assembled at the plant of the National Phonograph Company, at Canton.

A move of this character was absolutely necessary owing to the large demand for Air-o-phones. Increased manufacturing facility was needed quickly and the new arrangement will permit the manufacture of sufficient Air-o-phones to take care of part of the present demand. The estimated production will be in the neighborhood of 300 machines weekly.

Lewis T. McFadden, president of the National Phonograph Company and Congressman from the Fourth Pennsylvania District, has been elected vice-president of the Air-o-phone Corporation.

THE WIRELESS APPLIANCE CORPORATION, 513 Sixth Avenue, New York City, announce their Pan-Audio Receiver, Type 102, and their Pan-Audio Amplifier Type OF-3. Connections can be made that enable the Pan-Audio to cover a wave-length range from 175 to 5,000 meters. A diagram showing the different connections accompanies each set. The Pan-Audio is a vacuum-tube set, the result of the combined study and work of the Wireless Appliance Corporation's radio experts, and is designed to meet the demands of the most exacting radio buyers.

The manufacturers claim for the Pan-Audio, high efficiency, neat appearance, high-grade workmanship and a remarkably low price considering the efficiency of the set.

Now comes the collapsible aerial that may be folded up and carried from place to place, to be erected on the roof, in the room, on the motor-car or motor-boat, or hung out the window. This aerial

will prove popular with vacationists and campers who will be moving about and want to rig their aerial on short notice. The Collapsible Aerial is made by the Adjustable Radio Rigging Company, 330 West 42nd Street, New York City.

New Firms and Corporations

(The firms and corporations mentioned in these columns can be reached by communicating with the attorneys, whose addresses are given whenever possible).

Century Specialty Co., 1221 Pennsylvania Ave., N. W., Washington, D. C. George W. Adolph and David J. Meyers.

Radio Appliance Co., 6426 Hollywood Boulevard, Hollywood, Calif.

Perry-Calkins Co., 333 Ontario St., Racine, Wis. R. R. Garrick, 126 North Redfield St., Philadelphia, Pa.

Radio Devices Co., Manhattan, \$20,000; G. E. Bierce, O. A. Hollister, E. L. Neptune. (Attorney, W. J. Spalckhaven, 115 Broadway, N. Y.)

Hanover Radio Corp., Manhattan, \$5,000; A. Bishop, M. De Lorme, R. L. Schweriner. (Attorneys, Newman & Butler, 116 Nassau St., N. Y.)

Great Eastern Radio Corp., Del., \$2,000,000. Has designated as representative, H. R. Kohm, 25 Broadway, N. Y.

Hutchison Radio Co., contracting, \$4,100,000; K. A. Graham, M. J. Bidwell, M. H. Roeger, New York. (Delaware Registration Trust Co.)

Modern Radio Corp., Wilmington, Del., apparatus, \$500,000. (Colonial Charter Co.)

Radio Finance Corp., Manhattan, \$20,000; L. Esmonde, D. Bransilver, S. Wedeen. (Attorneys, Epstein Bros., 2 Rector St., N. Y.)

P. and E. Brewer Radio Co., Manhattan, \$5,000; P. and E. Brewer, L. Iorio. (Attorney, H. C. Seward, 115 Sixth Ave., N. Y.)

Schiff Radio and Electric Corp., Newark, \$150,000; Paul Depatter, E. A. Roat, Robert Miers, Newark, N. J.

Concerto Lamp and Radio Corp., New York, phonographs, \$250,000. (U. S. Corporation Co., 65 Cedar St., New York.)

American Radio Association, Manhattan, promote use of wireless, \$10,000; W. Neale, A. G. Gennert, R. G. Albrecht. (Attorney, S. V. Ryan, Albany, N. Y.)

General Radio Products Co., Philadelphia, apparatus, \$100,000. (Corporation Guarantee & Trust Co.)

Anderson Durand Radio Corp., Rochester, \$100,000; M. H. Anderson, S. E. and J. E. Durant. (Attorney, D. C. Munson, Rochester, N. Y.)

H. A. H. Radio Manufacturing Co., Manhattan, \$30,000; H. Harris, R. Arnold, K. Hellmuth. (Attorneys, Lind, Pfeifer & Crames, 46 Cedar St., New York.)

X-Rad Corp., Manhattan, make radio outfits, \$20,000; E. M. Clarick, L. O. Smith, O. O. Lee. (Attorney, A. M. Grill, 34 Wall St., New York.)

Crescent Radio Mfg. Corp., Manhattan, \$25,000; H. C. Broems, R. Davison, C. P. Cadman. (Attorneys, Lind & Pfeifer, 46 Cedar St., New York.)

Brooklyn Radio Co., Brooklyn, \$10,000; W. Kirkpatrick, O. H. Young, F. Gubing. (Attorney, T. Downs, 2 Rector St., New York.)

American Bell Radio Corp., apparatus, \$200,000; George H. Bell, Walter E. Carleton, Brooklyn; David J. Marks, New York.

Williams Radio Battery Co., Wilmington, Del., manufacture, \$30,000. (Corporation Service Co.)

Radio Products Mfg. Co., Manhattan, \$5,000; H. Techlauf, G. Bober, F. Czerwenka. (Attorney, R. L. Levenson, 799 Broadway, New York.)

The following firms are all in New York City: Cassidy Bros., 59 St., & 2nd Ave.

Rialto Radio, 1487 Broadway.

Schullstun, 1 West 45 St.

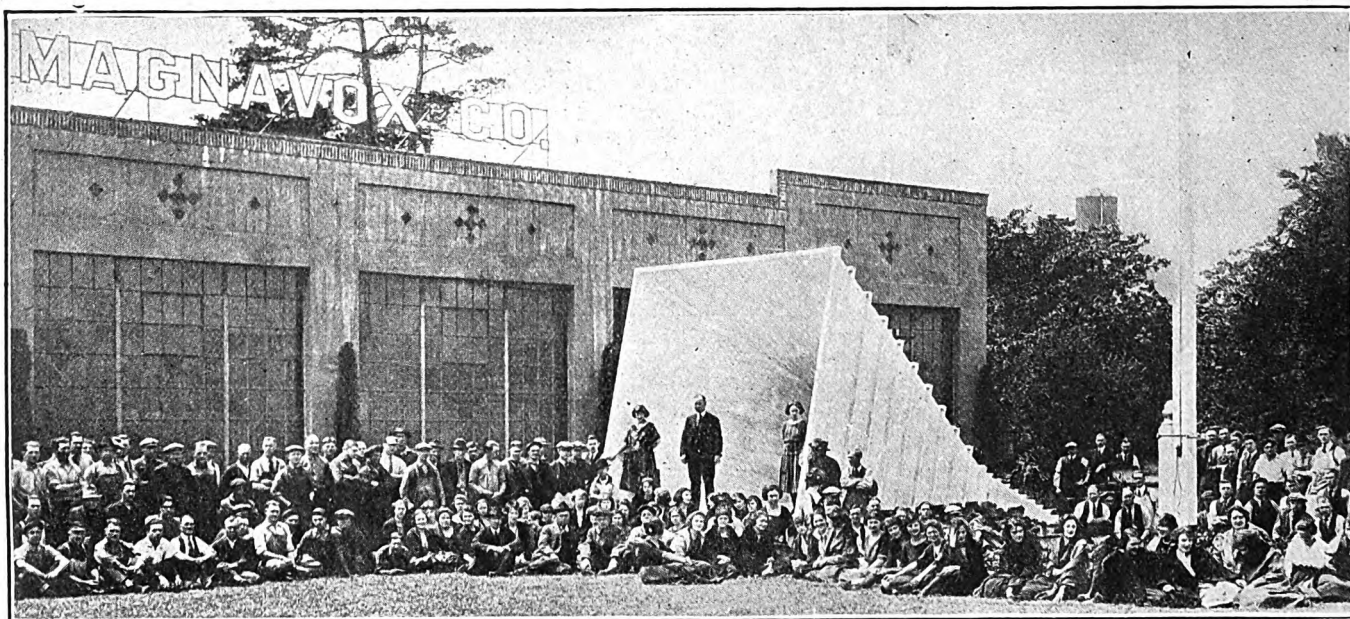
Jones Electric Shop, 44 St., near 6th Ave.

Brackman Elec. Co., 657 West 181 St.

J. Kesner, 150 East 59 St.

(Continued on next page)

The World's Largest Radio Horn



IDORA Park, a public amusement resort in California, boasts possession of the world's largest horn. Measuring thirty-five feet in length, with an opening twelve feet square, this horn was recently installed for broadcasting music received by radio, and is in successful daily operation at the present time. Equipped with the Magnavox radio reproducer and, also, the Magnavox Power Amplifier, the broadcasting capacity of this gigantic instrument is sufficient to carry radio music through-

out an area of approximately twenty-nine square miles. One thousand feet of clear air-plane spruce-lumber went into its construction, which incidentally presented a number of interesting problems to the Magnavox engineers by whom it was designed and built.

Of absorbing interest first of all on account of its sheer size and amplifying range, this gigantic instrument appeals to the imagination. A spectacular stunt on the part of an enterprising amusement re-

sort, the basic idea is capable of really impressive development. It is a further indication of the far-reaching influence of radio on the world's work and play which warrants attention.

To the radio expert, however, the most interesting aspect of the situation is the fact that the Magnavox Company, through the use of its electro-dynamic reproducer, has produced such true tones as to eliminate distortion even when employing this very large horn.

(Continued from preceding page)

Friedman Elec. Co., 1405 Third Ave.
 Goldhouse Radio Phone Co., 49 St. & 7th Ave.
 International Radio Exchange, 1983 Broadway.
 S. & N. Radio Supply Co., 2106 Broadway.
 John F. Driscoll, 467 Columbus Ave.
 R. Simpson, 35 West 116 St.
 Radio-Phone Equipment Co., 436 Seventh Ave.
 Ace Electric Co., 209 West 33rd St.
 Hart & Love, 780 Sixth Ave.
 Columbus Circle Elec. Co., 875 Ninth Ave.
 Griffin Radio Service, 51 East 42 St.
 Hoyt Electric Co., 686 Lexington Ave.
 A. & A. Electric Co., 39 St. & 7th Ave.
 Triggers, 160 East 59 St.
 Lexington Radio, 44 St. & Lexington Ave.
 Hess & Hicks Elec. Co., 414 West 42 St.
 Radio Battery Service Club, 81 W. Fordham Rd.
 Fordham Radio Co., 140 E. Fordham Rd.
 Frank Knott, 606 Bergen Ave.
 Geils & Friedlander, 622 Melrose Ave.
 Hawk, 558 Melrose Ave.
 Phillip Glick, 433 West 125 St.
 Grammercy Elec. Eng. Co., 52 West 30 St.
 Brownell & Kraft, 506 Sixth Ave.
 Joseph B. Josephson Co., 3154 Third Ave.
 Benkwitt, 441 Willis Ave.
 C. C. Bohn Elec. Co., 820 Sixth Ave.
 Belmont, 906 Sixth Ave.
 Bronx Elec. Supply Co., 612 Melrose Ave.
 Manhattan Elec. Lamp Co., 800 Lexington Ave.
 Stanley Ruth Co., 718 Madison Ave.
 Knickerbocker Electroliner Co., 807 Sixth Ave.
 Radio Sales Co., 23 East 14 St.
 Morrison Electric Supply Co., 15 East 40 St.
 Koch & Schwarz, 602 Third Ave.
 Silver Radio Supply Co., 2305 Broadway.
 D. H. Morris Radio Co., 1024 Lexington Ave.
 Broadway Radio, 2525 Broadway.
 Rush Radio & Elec. Appliance Co., 8 East Fordham Rd.
 Electrical Engineering Corp., 716 Eighth Ave.
 Eclipse Electric Co., 618 Ninth Ave.
 E. J. Williams, 1674 Broadway.
 E. J. Edwards, 1976 Broadway.
 Kelloh & Bertine, Madison Ave. and 59 St.
 Shuck Radio Co., 1274 First Ave.
 Atlas Radio Sales Co., Manhattan, stock and bond merchants, \$10,000; S. W. Weber, I. Sass, F. Miller. (Attorney, A. Goldfarb, 5 Columbus Circle, N. Y.)
 Rocky Mountain Radio Products, Manhattan, \$5,000; F. Reiss, H. Grayer, C. Heckelman. (Attorneys, Lewis & Schaap, 299 Broadway, N. Y.)
 Radio Press of America, Manhattan, \$50,000; B. B. Borg, A. Bullman, A. N. Birenbach. (Attorney, C. Y. Palitz, 111 Broadway, N. Y.)

PAPER TUBES FOR WIRELESS
 ALL SIZES ON HAND
 FOR IMMEDIATE DELIVERY
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**POTTSTOWN RADIO
SUPPLY COMPANY**
 Pottstown, Pa.

United Radio Manufacturing Corp., Dover, Del., apparatus, \$500,000. (U. S. Corporation Co.)
 American Radio Exposition Co., \$1,200,000; Walter Neale, Alfred G. Gennert, New York; Ralph C. Altorecht, Brooklyn. (U. S. Corporation Co.)
 Radio Costume Co., Manhattan, \$10,000; C. Flashnick, M. Witkoff, D. Goldsher. (Attorneys, Flashnick & Sustick, 874 Broadway, N. Y.)
 Northern Radio Supply Co., Manhattan, realty, \$10,000; E. A. London, I. Weissberger & Leichter, 93 Nassau St., N. Y.)

Franklin Radio Corp., Philadelphia, manufacture wireless telephone, \$250,000. (U. S. Corporation Co.)

Lissen-in-Radio Co., Ridgefield, \$25,000; Bertha Rappaport, Jennie A. Fisher, Pauline L. Rappaport, Ridgefield, N. J.

Radio Record, Manhattan, \$150,000; A. Miller, E. M. Simpson. (Attorneys, Simpson & Simpson, 356 5th Ave., N. Y.)

Signal Radio and Electric Corp., Manhattan, \$10,000; S. Eisenstadt, F. S. Vincent. (Attorney, I. Orleans, 130 West 42nd St., N. Y.)

Radio Manufacturing Co., Manhattan, make radio apparatus, \$10,000; H. A. Weeks, J. D. Morrick, A. Loisi. (Attorney, G. J. Giudici, 61 Park Row, N. Y.)

Atlantic Radio Corp., Manhattan, \$10,000; N. Piro, V. A. Mojo, L. J. Laternine. (Attorneys, Kramer, Bourke & Galgano, 130 West 42nd St., N. Y.)

Allied Radio Co., Manhattan, \$100,000; M. Ettenberg, H. Shapiro, A. G. Heller. (Attorney, D. Marcus, 300 Madison Ave., N. Y.)

Radio Clearstone Corp., Bronx, \$20,000; H. Meisinger, H. D. Daneny, F. Metz. (Attorney, B. J. Levy, 45 West 118th St., N. Y.)

Coming Events

MILO E. WESTBROOKE RADIO SHOW.—Leiter Building, Chicago, June 25 to July 1.

FIRST CENTRAL WEST RADIO SHOW.—Auditorium, Milwaukee, Wis. Week of June 21.

SPRINGFIELD RADIO EXPOSITION, Springfield, Mass. Under auspices of Springfield, Mass., "Daily Union." June 19, 20, 21, J. P. O'Connor, managing director.

CHICAGO RADIO SHOW, Coliseum, Chicago, Ill., October 14 to 22. U. J. Hermann, managing director, 549 McCormick Building.

KANSAS RADIO EXPOSITION will be held at the Kansas State Fair, Hutchinson, Kansas, September 16 to 22 inc. A. L. Sponsler, Secretary.

No Summer Slump

According to that journalistic barometer of trade and advertising, "Printers' Ink," there will be no slump in business this summer. We agree with "Printers' Ink." Reservations for advertising in RADIO WORLD for July and August prognosticate a fifty-per-cent. increase. In fact we are now figuring on increasing the number of pages of RADIO WORLD. We believe all business is on the up-grade and that improvement will be both sure and steady.

Capital Increases

The Liberty Radiofone Company of New York, has increased its capital from \$500,000 to \$2,000,000.

Provision has been made by the Western Electric Company so that all holders of its five-year seven-per-cent convertible gold bonds may exercise the right to convert them at face value into shares of the 7 per cent. cumulative preferred stock of the company at any time until and including October 1, 1924. The new securities have a par value of \$100 each.

Fifty-two issues for \$6.00. Sub-Department, Radio World, 1493 Broadway, N. Y. C.

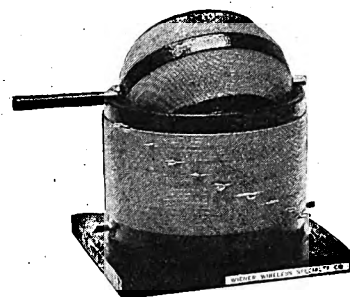
NEW RADIO PATENTS

That Need Financing
 10-in-one reff'able. Snap fuse plug, reffillable pull-out fuse plug. Refillable Cartridge Fuse. New Radio Binding Post. Telephone Head Set. Horn adjuster. Instantaneous near and remote signalling flow and level indicator. I have several most valuable Radio patents that need proper financing. For demonstration and full details, address,

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Up-to-the-minute
**POPULAR
SELLERS**



Price, \$4.50 Each



Price, \$5.00 Each

Our standard varicoupler and variometer here illustrated, are not only attractive in appearance but are manufactured of the best material and in accordance with rigid engineering specifications, in our own factory by competent craftsmen. Each and every unit is carefully examined and tested before shipment assuring uniformity of quality and product.

Our "Induction Units" department in which these varicouplers and variometers are made has been liberally increased in size so that we can assure prompt shipments in any quantity.

**"Every Customer On Our Books
Must Be A Pleased Customer"**
 This is our aim and policy.

We are also manufacturers and distributors of "Nerco" 2,200-ohm phones, crystal detectors, variable condensers, fixed condensers, dials, knobs, rheostats, binding posts, galena cups, lever contact switches, switch contact points, insulators, magnet wire, tuning coils equipped with two sliders, V. T. sockets, and complete outfits—THE "WIENER" LINE IS A COMPLETE LINE.

INQUIRE ABOUT OUR
LITTLE SET

Listed without phones at \$5.00

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Liberal Discounts to the Trade.

**WIENER WIRELESS
Specialty Company**

21 ACADEMY ST.
 NEWARK NEW JERSEY

Are You a Member of the N. O. D. C.?

If You Have Ever Experimented in Circuits,
You Certainly Are

By *Rutherford Hackett*

WITH cryptic initials such as QRM, CW, MFD, and others too numerous to mention, actually crowding radio waves out of their proper place in the ether, the abbreviation at the head of this article will scarcely startle the reader, no matter how gentle he may be. But since this is not a fiction story, the meaning of the four letters is divulged immediately. It refers to that great and growing body which may be called the National Order of Diagram Chasers. Practically every one in the new audience of radio amateurs has been—perhaps, still is—a member of the order.

A person interested in radio cannot have read any of the radio publications without being impressed by the results some contributor has obtained with a fancy hook-up. To be sure the change in the hook-up referred only to the change of a condenser from one side of the vacuum tube to the other; but according to the story: "The new arrangement brought in three stations that I had never heard before."

After reading this statement, a member of the N. O. D. C. hies himself to his radio shack and after testing his apparatus to see that his favorite broadcasting station is coming in O. K., (more cryptics), he proceeds to cut connectors, shift variometers, twist condensers, and juggle joints until he has copied the hook-up lauded in the magazine. And then he tunes—and tunes—and tu—ah! there it is. A spark station with a peculiar tone. He had never heard that bird before. Wonder who it might be?

After listening there at the new shrine for a minute or two, he swings back to where the broadcasting station used to tune in. But no station there to-night. Finally after exploring awhile, he finds it; but try as he will, the words and music come in weaker than they should. He thinks that his batteries may be getting weak. Perhaps he has short circuited something while making the change over. He looks over the set, tests a joint or two, and tries again. No better this time. So, giving it up as a bad task, he manipulates the knobs again and succeeds in bringing in several new—to him—spark stations. Half an hour later, he may be seen changing his hook-up back to the "old reliable." The N. O. D. C., has lost another enthusiastic member.

It would be interesting to study a poll of radio amateurs who have been experimenting with various hook-ups, to see how many can truthfully say that they have ever improved on their original connections. Undoubtedly the percentage of optimistic ones would be small. There is a real reason for this; evidently a reason that few have considered.

Fundamentally, there are but few receiving circuits. Each circuit consists essentially of a roll of inductance and a bunch of capacitance, attached at one end to a detector and a set of phones. But

these fundamental circuits can be juggled around on paper a dozen different ways, seeming to supply in each new way, a new hook-up. As an example, consider the variocoupler and two variometer regenerative circuit, so widely used among 360-meter fans. The usual position in the diagram for the grid variometer is between the top lead of the variocoupler and the grid condenser. Supposing someone placed that grid variometer in the lower lead of the coupler. Would you change your hook-up and try it out? Perhaps not; but hundreds have. Unless the guessing is poor, they also changed it back because they certainly would get no better results.

The same thing has happened in other particulars of radio circuits. Sometimes the signals were bettered, but more often they were not improved and frequently they were poorer.

If an amateur makes his instruments

from published diagrams and instructions, he generally gets his best results from the published hook-up because the instruments have been designed and assembled with a given purpose in mind. As a rule, the original builder has tried out the various possibilities in the way of diagrams and has selected for you the one that works the best. When you alter the diagram, you are merely duplicating the work he has done.

The fictitious personage mentioned at the beginning of this article, picked up several new spark stations but lost his broadcaster. He changed his set and changed his wavelength. His set was not made to work on both types of stations. When he endeavored to straddle the situation he lost out in efficiency.

Some members of the N. O. D. C., may come back with the statement that experimenting with circuits may result in a sensational discovery. It might. But it would be an accident, and it is doubtful if the D. C., would recognize the discovery when it popped before him. He would try to better what he had discovered and lose the secret of the sensation. Major Armstrong discovered the regenerative circuit you are now using, but he didn't do it by chasing diagrams. He did it by making diagrams after studying what he already knew about his apparatus.

Use the hook-up you have. Study it from all angles. Study every inch of the wiring and all the connections. Find the reason for everything. And refuse to change the connections until you are convinced that something is wrong with it as it stands.

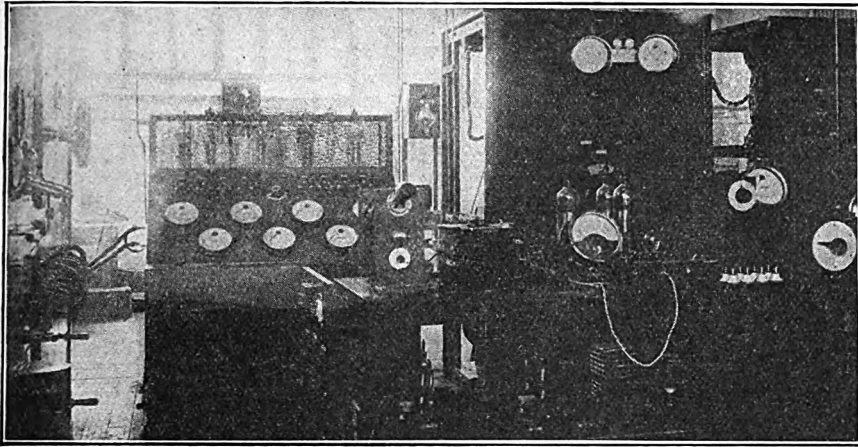
Ten P. M., in Thousands of Homes



(c. Fotograms, N. Y.)

Many radio fans say that they derive the greatest pleasure and suspense waiting for ten o'clock to roll around every night, for precisely at that hour the time tick is sent out from Washington, D. C. It is gauged to the most ultimate fraction of a second. Thousands of people throughout the country now set their time pieces by radio. Richard Barthelmess, the moving-picture actor, posed for this photograph.

Germany's First Broadcasting Station



(c. Kadel & Herbert News Service)

This is the first broadcasting station in Germany. It is located in Berlin. The equipment is all first class and of latest design.

Radio Should Pay for Broadcasting

An Important Letter to Radio World from E. C. Mills, Chairman Executive Board of the Music Publishers' Protective Association

Editor, RADIO WORLD: I have been much interested in the article of your issue of May 20th, by Mr. Everett Ewing, in which there are propounded a number of questions as to the effect that radio may have on various productions and activities.

Mr. Ewing asks the question, "Will Radio Increase Author's Royalties?" Answering the question, he is of the opinion that the so-called "plug," or advertising that a musical composition will receive from being broadcast by radio will result in such materially increased sales of the composition as to remove any apprehension on the part of the author and composer that radio broadcasting will have an adverse effect upon royalties.

Radio is, of course, the most amazing development of the times. To the layman it is a mystery, all the more intriguing and fascinating because although he cannot understand how or why it is that a receiving set gathers from the thin air and makes audible sounds which the ear does not hear, except through the medium of a receiving set, it does do this to his delight and entertainment.

Radio unquestionably is destined to become an enormously important factor in everyday life, and it is entirely within the bounds of reason and possibilities to assume that it may become just one more factor interfering with the development of personal and individual musical talent and ambition. In other words, it is becoming constantly more and more noticeable as phonographs and player pianos increase in number that the sales of sheet music decrease. There are not so many students of the piano as there used to be. I am informed that there are nowhere near so many music teachers with as large classes as there used to be.

Apparently the rank and file of the people and the great majority of young men and women are losing their incentive to undertake the work and study incident to the mastery of a musical instrument.

If this be true, we must anticipate a constantly decreased sale of sheet music; and if proper and just encouragement, is to be given authors, composers, and pub-

lishers, it follows that they must look to some other source for their livelihood.

What could be fairer than that radio now in process of building itself into a gigantic industry, enormously profitable to the manufacturer of the apparatus, should contribute a fair sum for the element which makes broadcasting interesting and entertaining. It is to be doubted that were it not for the musical entertainment being broadcast, any such almost universal interest in radio could have been aroused and developed. It is quite the custom to think of the royalties received by authors, composers, and publishers as huge; but you probably have as wide an acquaintance among these men as anyone in New York, and know that, on the average, their incomes are not swollen; that, in fact, their earnings comparatively are very modest.

In my opinion, it is not debatable but that broadcasting institutes a public performance for purposes of profit. If this be true, an infringement of copyright occurs every time a copyrighted composition is so broadcast without license from the proprietor of the copyright.

Unquestionably the purpose of broadcasting music and entertainments is to increase the sale of receiving sets. It is from this source that the profit flows, and it seems to me obvious that it is the plain obligation of the broadcasting companies to secure licenses permitting the public broadcasting of copyrighted musical compositions, and that they pay for such licenses such reasonable fee as may be demanded by the copyright proprietors.

The matter is now up to the broadcasting companies. It is hoped, of course, that an arrangement satisfactory to all concerned may be reached without litigation.

Proprietors of copyrighted music, so far as I have had opportunity to discuss the matter with them, are entirely sympathetic to radio, anxious to see it developed to the highest possible point of perfection, and desirous of seeing it fulfil its manifest destiny.—E. C. Mills, chairman, executive board, Music Publishers' Protective Association, 56 West 45th St., New York, N. Y.

MAGNAVOX

Radio

The Reproducer Supreme

An essential part of every receiving set.



—and even to this remote mountain hunting lodge

OVER land, over sea, swift and tireless as light itself, speed marvelous "wireless-programs" broadcasted from radio-transmitting stations in all parts of the country.

Wherever you live you can enjoy the city's most inspiring advantages—day after day—thanks to the wonderful service of the Magnavox Radio.

Magnavox Radio makes it possible for you to hear all that is in the air as if it were being played by your phonograph.

Without Magnavox Radio no wireless receiving set is complete.

Any radio dealer will demonstrate for you, or write to us for descriptive booklet and name of nearest dealer.

The Magnavox Co.
Oakland, California
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Radio brings it
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tells it

RADIO WORLD'S QUICK-ACTION CLASSIFIED ADS

This department is intended for everybody who wants quick action on short announcements covering the buying, selling, exchanging or general merchandising in the radio field. Readers of RADIO WORLD will find that it pays to read these columns every week. Advertisers will get a ten-day service here—that is, copy received for this department will appear in RADIO WORLD on the news-stands ten days after copy reaching us.

The rate for this RADIO WORLD QUICK ACTION CLASSIFIED AD. DEPT. is 5c. per word (minimum of 10 words, including address), 10% discount for 4 consecutive insertions, 15% for 13 consecutive insertions (3 months). Changes will be made in standing classified ads., if copy is received at this office before 4 P. M. on any second Tuesday preceding date of publication. RADIO WORLD CO., 1493 Broadway, New York City. (Phone, Bryant 4796.)

Enclose Self-addressed Envelope and receive free bulletin of various designs from which you may build your own Receiver from our blueprints. The blueprints show full constructional details, wiring diagram, bill of material and necessary data and we guarantee the performance of the model. Price of blueprints varies as to subject desired. Ask for bulletin No. 349. Experimenters Information Service, 220 West 42nd St., New York City.

We Manufacture All Radio Parts in large quantities. Logan Machine Co., 222 South Clinton St., Chicago, Ill.

LOFT FOR RENT—124 East 14th Street. Immediate possession. For terms, apply L. B. Schindler Co., 148 Duane St., N. Y. C.

PATENTS—Electrical cases our specialty. Pre-war charges. B. P. Fishburne, Registered Patent Lawyer, 386 McGill Bldg., Washington, D. C.

Big Money and Fast Sales—Every owner buys Gold Initials for his auto. You charge \$1.50; make \$1.35. Ten orders daily easy. Write for particulars and free samples. American Monogram Co., Dept. 198 East Orange, N. J.

Crystal Set That Gets Radio Concerts. Build it right boys. Plans and full instructions for building at low cost, high grade fine adjustable Crystal Receiving Set, fifty cents postpaid. Dept. R. D. Shaw Mfg. Co., Galesburg, Kans.

SAVE MONEY—Supersensitive galena quarter pound, 55c., half pound, \$1.00. Big sample, 30c. Streiff, 73 Flatbush Ave., Brooklyn, N. Y.

INSULATORS FOR AERIALS—Support your antennae properly. Prevent current leaks. Our antennae insulators are of hard glazed porcelain, the ideal insulating material. Made to withstand a pull of 2,200 pounds. Light, strong, inexpensive. Write for samples and full information. THE FEDERAL PORCELAIN CO., Carey, Ohio.

Cornetists, Trombonists, Saxophonists, Clarinetists, send for "Free Pointers." Mention instrument. Virtuoso School, Buffalo, N. Y.

RADIO DEALERS AND AMATEURS
DON'T BUY until you have investigated our line of Radio Instruments BECAUSE radio apparatus requires scientific knowledge and mechanical skill in the design and manufacture. Our experts have embodied these in our Special Broadcasting Receiving Sets, Audio, Radio-Frequency and Power Amplifiers, Loud Speakers and complete line of parts manufactured by us. LEE RADIO CORPORATION, HADDONFIELD, NEW JERSEY.

GOOD TERRITORY STILL OPEN FOR LIVE DEALERS TO HANDLE OUR COMPLETE LINE OF RADIO INSTRUMENTS

Special Broadcasting Receiving Sets, Crystal and Audion, Radio, Audio Frequency and Power Amplifiers, Loud Speakers and complete line of parts. Complete details on request. LEE RADIO CORPORATION, HADDONFIELD, NEW JERSEY.

Now In Stock.—Clapp Eastham HR Regenerative Receivers. Murdock Phones—3,000-ohms. Magnavox and other parts. Mail orders given quick attention. Sever-Beacham Radio Co., Santa Fe, N. M.

Exchange jolly interesting letters through our Club! Stamp appreciated. Betty Lee, 4254 Broadway, New York City.

\$133-\$192 month. Become Government Railway Mail Clerks. Men over 17. Common education sufficient. Steady. List positions free. Write immediately. Franklin Institute, Dept. F-152, Rochester, N. Y.

VARIABLE CONDENSERS, 23 plate, .0005 M. F. Panel type, accurately made and adjusted, big value, \$3.00, postpaid. Zeunert Co., 1752 N. Park Ave., Chicago, Ill.

B. & B. Radio-Phonograph Attachments are selling like wild-fire. Handsomely Gold Plated, \$4.00, sent by mail. Dealers and Salesmen wanted. Fits any machine. B. & B. Mfg. Co., 11024 E. Jefferson, Detroit, Mich.

Immediate Shipments.—Yes! That's what I'm offering on a limited number of Grebe OR 5's, Clapp Eastham and Westinghouse RO Receivers, Eveready B Batteries, Frost fones, Detector and Amplifier Bulbs. Order at advertised prices. Twelve hour service or your money returned. Geo. H. Rozum, Mitchell, S. D.

Smashed Wire Prices.—Copper aerial wire No. 14, 37c. lb. Magnet wire, S.C.O. No. 20, 97c.; No. 22, 98c.; No. 24, 99c. D.C.O. No. 20, 99c.; No. 22, \$1.00; No. 24, \$1.05 per lb. All sizes and insulations carried. Dealers write. Wolverine Wire & Mfg. Co., Shelby, Michigan.

For Sale.—One Penn O Type B Regenerative Cabinet, shielded Bakelite Panel, Chelsea Dials, Dark Oak finish. Set in fine working condition and appearance. Also Pair Murdock Phones. Price for both, \$50.00, cash. Address, H. J. Van Buren, 813 Butler Ave., New Castle, Penna.

PARAGON GREBE KENNEDY
We have for immediate delivery a few Paragon RA-10, \$75.00; Paragon RA Special, \$50.00; Grebe OR-5, \$80.00; Grebe RORR, \$55.00; Grebe RORD, \$75.00; Also Kennedy Intermediate and Short Wave receivers and amplifiers. These prices F. O. B. Red Bank, N. J. & V. Gregory, 41 Broad Street, Red Bank, N. J.

For Sale.—New Grebe OR-8 set, never set up. Cost \$80.00. First P. O. for \$65.00. One pair Western Elec. Head Phones cost \$15.00, first P. O. for \$11.00. Phones never out original box. D. G. Fox, 20 Fernwood Ave., Bradford, Mass.

IS YOUR HOOK-UP RIGHT?

Fifty (50) complete Vacuum Tube Hook-ups on Blue Prints with complete explanation. Includes: The V.T. as a detector and one step amplifier; regenerative circuit; V.T. to receive undamped and spark signals; one step radio frequency amplifier and detector; three stage audio-frequency amplifier; short wave regenerative circuits; Armstrong circuits; V.T. Radio telephone; radio-frequency amplifier and crystal detector; etc., etc. Send 50c. to-day in coin or money order and it will be mailed prepaid.

WESTBOARD RADIO ENGINEERS
309 Canal St., New York City

DEALERS

WE CAN SUPPLY

**Turney Receiving Sets
Corona Receiving Sets**

R. C. WESTINGHOUSE
RECEIVING SETS
HIGH GRADE HEAD PHONES
DETECTOR TUBES
All Other Radio Supplies

**CANADIAN-PACIFIC
RADIO CORP.**

N. Y. Office: 342 Madison Avenue
Suite 708. Phone Murray Hill 2185

NEW DISCOVERY

RUSONITE (patent pending)

The new radio chemical crystal rectifier, sensitive over entire surface. Eliminates buzzer tests and all detector troubles.

Loudness 50% greater than any crystal
Mounted Piece, 75c postpaid

Dealers write for proposition
RADIO CHEMICAL CO.
1361 40th Street, Brooklyn, N. Y.

Copies of Radio World No. 1.

If you did not get a copy of Radio World No. 1, send us \$6.00 and we will send you this paper for one year, and start it with our first issue, which will be mailed you as soon as possible after receipt of order. (Adv.)

The New Mystery Marvel

RADIO

Can Make You Money

A Battery is to Radio, what the record is to the phonograph; the blades to a safety razor. It costs you nothing to learn how you may participate in the future profits of the

**ACME BATTERY &
RADIO CORPORATION**

a growing concern, whose earning power is limited solely by its working capital.

Write at once for "Sparks" devoted to the outlook for this corporation. There is no obligation on your part.

INDUSTRIAL EXPANSION SERVICE

No. 1674 Broadway, New York City

RADIO WILL MAKE YOU MONEY

Well known established concern manufacturing WIRELESS specialties offers investors an opportunity to participate in big profits to be made in the WIRELESS INDUSTRY EXPANDING BUSINESS. Not a promotion.

ALL CAPITAL STOCK—

**No preferred shares or bonds
Price Advancing Rapidly**

Factory, offices and demonstrating rooms. Testimonials open for inspection. Strictest investigation invited. Call or write for information.

G. BOISSONNAULT CO.

26 Cortlandt St., New York.

Coe College Receives Radio Without a Ground

COE COLLEGE, IOWA, experiments have devised a new method of receiving without a ground which those inclined to experimental work should try out. Phone and C. W. (continuous wave) stations were found to come in more consistently and louder on the single-coil tickler-circuit, when the ground was disconnected and the ends of the loop antenna were connected to antenna and ground posts, leaving the regular antenna connected. Apparently this connection works one way only; that is to say, one end of the loop connects the antenna post only. The result of this connection will have a surprising effect. It will increase the intensity of the carrier wave to an almost unbelievable degree.

NATIONALLY KNOWN G - W SLIDERS



Advertised and used all the way from Honolulu to New York. Preferred because it makes perfect electrical contacts, wears better, works easier. Yet it costs no more than inferior elders.

Price—3/16" 25c., 1/4" 30c.

Ask for G-W Slider Rods
Dealers and Distributors Wanted

GEHMAN & WEINERT

42 Walnut St. Newark, N. J.

Dont's for Dealers

DON'T make any rash statements concerning the possible receiving range of crystal outfits.

Don't be too free with advice to customers unless you are sure that you can answer their questions without approaching uncertain ground.

Don't forget the importance of a receiving station in your shop. Let your customers "listen in" with the outfits they purchase.

If you expect to stay in business, make sure that the apparatus you stock is reliable.

Don't recommend bed-spring aerials with crystal receivers.

Don't forget that money spent on the development of goodwill at this time will pay a big dividend in the future.—"The Mail," New York.

What It Leads To

AS WILLIE timidly puffs his cigarette, he reads an adventure story of marvelous heroism—how the castaway became a king in the South Sea Islands.

When William puffs his first black cigar, the book by his side, is Sappho, or "Her Burning Passion."

"Bill" enjoys his old brier pipe, lets H. W. Wells plant his adventure, love, romance, and history.

When "Doc" advises less red meat and a consideration of vitamins—than we are maturing, getting "real" sense. What does Bill read? He does not read, he rests his eyes, he luxuriates in the twilight, enjoying the big armchair with his kiddies on his knees, while his good wife "tunes in" for—it's radio now.

Still After Mr. Garrick

Editor, **RADIO WORLD**: Replying to the letter of Ralph R. Garrick, published in your issue of April 22, we would like to say that we are two amateurs in the sense that we have receiving sets—they are not Westinghouse sets but our own make tube-sets. We are also studying up on code.

In reply to his statement that they should shut down all broadcasting stations, we think that even though he is an amateur with three years' experience and can copy "8" and "9," that he does not realize what he is saying when he declares that broadcasting will ruin wireless; for as any real amateur will tell you, it is helping it.

We have read every issue of the **RADIO WORLD** and think it the best yet.—A. C. Dreeke & H. Hempstead.

LISTEN-IN PHONES

Retail at
Factory Prices.

Enjoy your Radio
Concert with Century
Specialty
Phone. Absolute
Satisfaction
Guaranteed or
Money Refunded.



PRICE \$5.85

Immediate Delivery

Three reasons why we highly recommend these phones.

1. Highest quality of material used throughout.
2. Highly sensitive, matched tone.
3. Well built to stand hard service, easily adjusted to head.

ORDER DIRECT.

**CENTURY SPECIALTY
COMPANY**

1221 Pennsylvania Ave., Washington, D. C.

HOMCHARGE YOUR BATTERY for A Nickel

No mess, trouble, dirt—no moving of batteries—loss of time—no effort on your part—no technical or professional knowledge needed.

THE HOMCHARGER

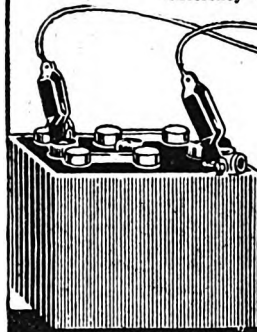
successfully meets all charging conditions, and is the only rectifier combining the following essential Homcharging features.

1. Self-polarizing. Connect battery either way and it will always charge. No danger of reverse charging, ruined battery or burnt-out rectifier.
2. No delicate bulbs to break or burn out. Only one moving and two wearing parts. These are replaceable as a unit, after thousands of hours' use, at small cost. Cannot be injured by rough handling.
3. Operation stops and consumption of current ceases immediately upon disconnecting battery.
4. The only charger costing less than \$100.00 that will fully charge a battery over night. Gives battery a taper charge—exactly as recommended by battery manufacturers. Guaranteed not to harm your battery even though left connected indefinitely.
5. Highest efficiency of any three or six cell charger made.
6. No danger of fire.

Approved by Underwriters. Immediate Delivery. Attention Motorists.

Will charge your auto battery as well as radio battery. Send for Bulletin No. 58 for further information.

For sale by all radio, electrical and accessory dealers or shipped, express prepaid, for purchase price, \$18.50. \$20 West of Rockies



The Automatic Electrical Devices Co.

135 West Third Street Cincinnati, Ohio
BRANCH OFFICES—New York, Chicago, Pittsburgh,
Los Angeles, New Orleans, Detroit, Toronto, Philadelphia, Baltimore, Dallas.

KEYSTONE VARIABLE CONDENSERS

**21 Plate
\$3.55**

**43 Plate
\$4.50**

Our selection of materials and built-up type design give assurance of low energy loss and high efficiency.

Agents and Jobbers write for information.

KEYSTONE MOTOR COMPANY

OAKS, MONTG. CO., PA.

Charles E. Hayes Co.

Wholesale Distributors of

Radio and Electrical Supplies

32-34 TAYLOR ST.,

SPRINGFIELD - - - - - MASS.

Telephone River 3515



SPECIAL OFFER TO DEALERS
3 and 4 inch Dials
Fixed and Variable Condensers
Klosner Vernier Rheostats
ALL RADIO EQUIPMENT

NEW YORK RADIOPHONE CO.
32 UNION SQ. - NEW YORK CITY

KRC**DEALERS AND JOBBERS****We Have for Prompt Delivery**

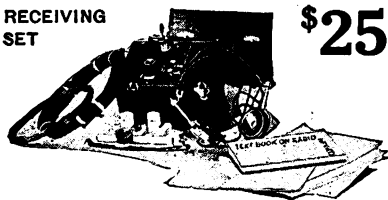
KRC—43-plate var. cond.	List \$4.50
KRC—23-plate var. cond.	3.75
KRC—3-plate var. cond.	2.75
KRC—Filament Rheostats	1.00
KRC—Fixed Condensers	.50
KRC—Vario-couplers	4.50

Packed in individual cartons.

Attractive Discounts—Write or wire your orders.

The KELLEY RADIO COMPANY

127 East Pearl Street, Cincinnati, Ohio

KRC**“MIRACLE”**RECEIVING
SET**\$25****With Double Head Phones**

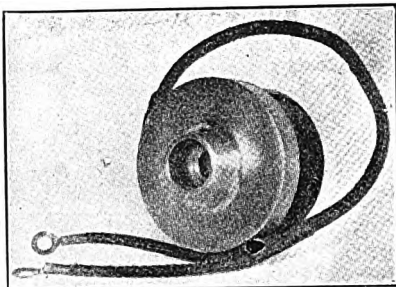
Also Copper Antenna Lead Wire, Ground Wire, Insulators and all the necessary parts that will enable you to hear everything within a range of from 25 to 50 miles.

Also included is a radio text-book with complete instructions and valuable charts.

SHIPPED PARCEL POST INSURED
UPON RECEIPT OF MONEY ORDER
OR CHECK

Send for a “Miracle” to-day

Metro Mail Order Co.
358 Fifth Avenue, New York City

**Phone Adaptor**

Make a loud speaker of your Phonograph by using the “Phone-Adaptor,” a Scientific Device which can be used with any make of Radio Head-Phones or Phonograph.

Made from a nickel aluminum alloy highly polished to match the fittings of most expensive instruments.

In ordering be sure to specify make of Head-Phones and Phonograph you have. Immediate delivery anywhere. Satisfaction guaranteed. Price \$1.00 postpaid.

Special discount to dealers in dozen or gross lots.

SEND FOR YOURS NOW**Harry D. Cromer, Agent**

30 CHURCH STREET
Room 919, New York City

New Broadcasting Licenses 47 Issued Between May 1 and 20 Bring Total to 257 for Year

- WBA American Telephone & Telegraph Co., New York.
WBAV The Erner & Hopkins Co., Columbus, Ohio.
WGM Georgia Railway & Power Co., Atlanta, Ga. (Atlanta Constitution.)
WBAQ Myron L. Harmon, Y. M. C. A., South Bend, Indiana.
WGI Iowa State College, Ames, Iowa.
WBAW Marietta College, Marietta, Ohio.
WBAC Republican Publishing Co., Hamilton, Ohio.
KNI T. W. Smith, Eureka, California.
WBAX John H. Stenger, Wilkes-Barre, Pa.
WCX Detroit Free Press, Detroit, Mich.
WCAE Kaufman & Baer Co., Pittsburgh, WPa.
WCAB Newburgh News Print & Pub. Co., Newburgh, N. Y.
WBAZ Times-Despatch Pub. Co., Richmond, Va.
KLX Tribune Pub. Co., Oakland, Calif.
KOJ University of Nevada, Reno, Nev.
KZV Wenatchee Battery & Motor Co., Wenatchee, Wash.
WBAP The Star-Telegram, Wortham-Carter Pub. Co., Ft. Worth, Texas.
KYI Bakersfield Californian, Bakersfield, Cal.
WCAG Daily States Pub. Co., New Orleans, La.
KNX Electric Lighting Supply Co., Los Angeles, Cal.
WCAC John Fink, Jewelry Co., Fort Smith, Ark.
WCAD St. Lawrence University, Canton, N. Y. (Only weather.)
KQI University of California, Berkeley, Cal.
WCAZ—Robert E. Compton & Co., Quincy Whig Journal, Quincy, Ill.
KDZV—Cope & Cornwell Co., Salt Lake City, Utah.
WCAV—J. C. Dice Electric Co., Little Rock, Ark.
WDAD—William Louis Harrison, Central Kansas Radio Supply, Linsborn, Kansas.
KDYC—Herald Publishing Co., Klamath Falls, Ore.
WDAI—Hughes Electrical Corp., Syracuse, N. Y.
WDAC—Illinois Watch Co., Springfield, Ill. (Weather only).
WDAF—Kansas City Star, Kansas City, Mo.
WCAY—Kesselmen O'Driscoll Co., Milwaukee, Wisc.
WDAG—J. Laurence Martin, Amarillo, Texas.
WDAK—Mine & Smelter Supply Co., El Paso, Texas.
WAAD—Ohio Mechanics Institute, Cincinnati, Ohio.
WCAW—Quincy Herald and Quincy Electric & Supply Co., Quincy, Ill.
KDYW—Smith-Hughes & Co., Phoenix, Ariz.
WDAB—M. C. Summer & Son, Portsmouth, Ohio.
WKB—Sweeney School Co., Kansas City Mo.
WDAE—Tampa Daily Times, Tampa, Fla.
KDYS—The Tribune, Inc., Great Falls, Mont.
WCAX—University of Vermont, Burlington, Vt.
WDAA—Ward-Belmont School, Nashville, Tenn.
KDYV—Rocky Mt. Radio Corp., Denver, Colo.
WDAJ—Atlanta & West Point R. R. Co., College Park, Ga.

A REAL VARIABLE

THE HAYNES VARIABLE CONDENSER was designed before it was built. IT DOES NOT LEAK. DEALERS—Here is a condenser worth twice the price, yet there is plenty in it for you. Write for particulars. We can make delivery.

The Haynes Radio Shop
629 Lexington Avenue, New York City

Protect Your Home and Set JACOBUS VACUUM Aerial Protector

Approved by
Underwriters
to Replace
Ground
Switch.



The Way
Your
Telephone
Line is
Protected.

Type J. S. W.

Protection from the Inside

Automatic safety features of the JACOBUS permit inside installation—just the same as for the protector on your telephone line.

No Ground Switch Required

Carries off all static and lightning automatically without damage to itself or interference with your set. Protection every minute of the day and night.

\$2.00 at your dealers

Dealers Write for Discounts.

**Apex Electrical Specialty
Co., Inc.**

77 ORANGE ST., NEWARK, N. J.

Another Attractive Proposition offered by

Randel



3 inches in diameter

A perfectly constructed dial made of the best dielectric material—pure black—accurately balanced—clearly engraved white figures from 0 to 100 are scientifically arranged as illustrated, affording fine adjustment—bored for 3/16 and 1/4 inch shafts.

Price, \$1.00 each

Send \$5.50 for sample box of 10.

Liberal discounts in quantities.

RANDEL WIRELESS CO.

9 CENTRAL AVE.

Newark,

New Jersey

RKM for This Week

ROY K. MOULTON, humorist of "The Evening Mail," New York, has a broadcasting station of his own. The best part of it is the program arranged by this happy gloom destroyer. Here is what Mr. Moulton will hurl at his phonotron this week:

- 7.10—Croton bugs at play.
- 7.28—"My Impressions of America," by Michael J. Gump, the well-known subway guard and traveler.
- 7.37—Special performance by Conan Doyle's spooks, including slate writing, cigarette smoking, bell ringing and other wonderful feats.
- 8.03—Ouija board demonstration by Rajah, the celebrated Jersey City mystic. (Noiseless.)
- 8.18—Motorcycle race on Velodrome at Jersey City (also noiseless).
- 8.42½—Battleship *Wyoming* posing for photograph under Brooklyn Bridge.
- 9.01—Street Cleaners' Band recital (without instruments).
- 9.13—Lecture, "If They Got It, I Get It," by Izzy Einstein.
- 9.32—Mayor Hylan dodging ticker tape and cheers during police parade.
- 10.00—Correct time from Steeplechase Park, Coney Island.
- 10.27—Topics of the Day and E. Sopp's Fables.
- 10.36—Nightshirt Tales for Children, by Gimbel Brothers.
- 10.47—Trick bicycle riding by Joe Jackson.
- 10.51—Baseball game by the Hippodrome elephants.
- 11.00—Good-night.

Development of New Apparatus

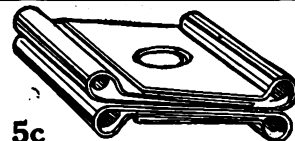
PROBABLY the real replacement business in the radio industry will come in the near future. Developments of new apparatus are taking place continually, and so fast is the industry moving that it is predicted that, three months hence, all the present receiving sets will be as out-of-date as a last summer's straw hat, says "Automobile Topics." This will mean the replacing of present sets with new, and will create a "used set problem" eventually. However, so great is the present demand that used sets easily are disposed of, at almost new prices. To-day the crystal set is considered as a "feeder" to the sale of the bulb set, and it is probable that for some time the present sets, when they become obsolete, will act in the same capacity for the new apparatus.

Tufts Seeks to Serve by Radio

IN discussing the new method of teaching, a number of the Tufts faculty admitted that it was frankly an experiment. "Whether we shall meet any demand on the part of the public by giving these lectures remains to be seen," he said. "A very large part of the radio broadcasting now is being done purely as a public service. Tufts College seeks to serve the public in every possible way and several members of the College faculty have volunteered to undertake this work without remuneration. The possibilities are manifold, and it is only a matter of a short time, in my opinion, when information of all kinds will be transmitted by radio."

To many anxious inquirers

RADIO WORLD has no free list. One copy is sent as a voucher to each advertiser or advertising agent represented in current issues. All other copies are paid for on subscription or through the news trade.



5c each

Duplex and Multi-plex Binding Post Clips
Each spring brass clip adds four extra connections to a binding post. Especially useful for hooking up extra phones.

No. 20 Fixed Condenser
.001 M.F.D. capacity. Made of high dielectric, processed varnished paper and tested at 110 volts.

Hedden Place Machine Co.

Office and Factory
41 Hedden Place, E. Orange, N. J.

TRADE **HPMCO** MARK
Reg. U. S. Patent Office

Radio Products With the Exclusive Features

Every "HPMCO" product embodies a decided improvement. That's why you're always sure of getting the best and latest when you insist on this trademark. Condensers — Detectors — Knocked-down Detectors — Tuning Coils — etc.

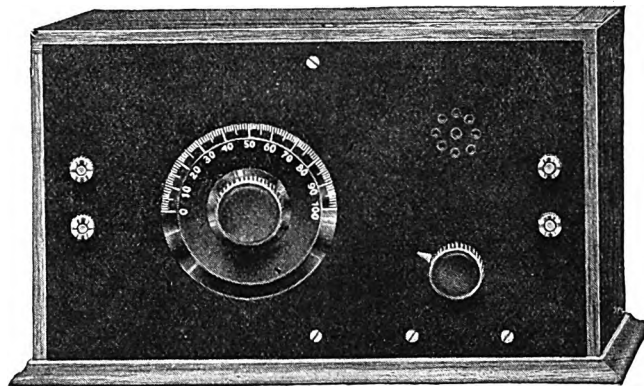
At All Good Dealers

Each 75c.



TUNER AND DETECTOR SET

Encased in a solid oak cabinet, mounted on XX Grade Bakelite panel. This is a complete outfit which can be hooked up by anyone. Includes B Battery, Bulb and Head-phones, postpaid.....\$50
Remit by Money Order.



NOT
A
TOY
BUT
A
REAL
WIRELESS
PHONE

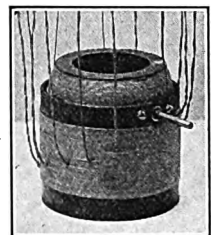
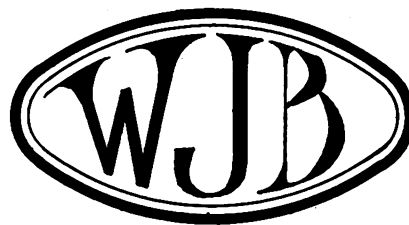
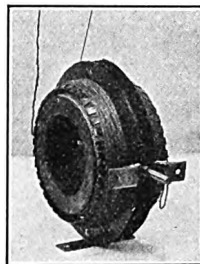
RECEIVES
MUSIC
AND
VOICE
CLEARLY
AND
LOUDLY

TYPE B-1. 150-800 WAVE METERS.

We can supply a two-stage amplifier to match above set for \$39.
Less Bulbs and Batteries

BEACON RADIO & ELECTRIC CO.

246 GREENWICH ST., NEW YORK CITY
Full line of Radio Equipment on hand.



VARIOMETERS and VARIOCOUPERS

OF THE BETTER KIND

VARIOMETER
PANEL TYPE, \$5.50

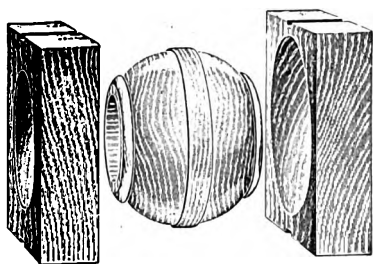
VARIOCOUPLER
PANEL TYPE, \$5.50

Discount in quantities, 175-600 meters.

WARREN J. BAUMAN CO.

LOCK HAVEN, PA.

ROTORS AND STATOR SECTIONS



126 Liberty Street, New York

Carefully and accurately made from specially selected and treated woods. Not "mere wood turnings" but manufactured to pattern makers standard. Rotors packed 50 and 100 in package. Stator sections packed 100 and 200 in package. Dealers! Send for interesting circular and attractive proposition. Write Dept. 46.

Norris Electrical Specialties Co.,

Incorporated
Telephone, Rector 6669

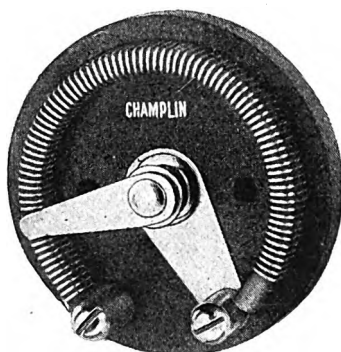
Established 1860

Tel. Barclay 8676

CHAMPLIN FILAMENT RHEOSTAT

Dealers and Distributors: Wire for Discount

\$1.00
List
\$1.00



Resistance
5.24 Ohms

Immediate Delivery
JOBBER AND WHOLESALE
Wire for Discounts

Champlin Mfg. Co.
90 WEST BROADWAY, NEW YORK CITY

Radio Supplies AT A BIG SAVING

	List Price	Our Price
Radiotron UV 201 Amplifying Tube	\$6.50	\$5.85
Western Electric Phones, 2,200-ohms, Per pr.	15.00	13.50
Murdock Phones, No. 56, 3,000-ohms, Per pr.	6.00	5.40
Federal Phones, 2,200-ohms, per pr.	8.00	7.00
Acme A-2, Amplifying Transformers Semi-mounted	5.00	4.50
Paragon Amplifying Transformers, mounted	5.00	4.50
Federal Plugs	1.75	1.50
Eveready B Battery, Type 766, 22½ Volt	3.00	2.50
Eveready B Battery, Type 763, 22½ Volt	1.75	1.35
Brach Vacuum Gaps for Lightning protection, Inside Type	2.50	2.25
Outside Type	3.00	2.75
Paragon V.T. Sockets	1.00	.85
Paragon Rheostats	1.50	1.35
Thordarson Amplifying Transformers	4.50	4.00
Gen'l Radio Amplifying Transformers	5.00	4.50

Through our long established connections and mail order methods, we are able to sell you standard radio supplies at less than prices at the average radio store. Satisfaction absolutely guaranteed.

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Our supply of back numbers of RADIO WORLD (Nos. 1 to 10) is limited. We will take orders for the first ten issues until the supply is exhausted. If you want these numbers, or want your subscription to start with any special number, let us know. Radio World Co., 1493 Broadway, New York City. (Adv.)

Answers to Readers

I have a receiving set of the regenerative type, and hear WVP loud and clear. I understand that WVP operates on a wave length of 1,450 meters. Can you explain why it is that I hear him so clear on this wave without loading up?—Buddie Oetjen, Queens, L. I.

What you hear is WVP on one of his harmonic waves. In the daytime, some of the waves are absorbed by the air, which is ionized by the action of the sun's rays. At night, naturally this atmospheric action is absent, permitting the waves to travel further.

* * *

I have an antenna about 100 feet long, and am not using a lightning switch. Will I be fined if my set is inspected?—St. Louis, Mo.

Better install a 100-ampere lightning switch, and comply with the law. Read the article in RADIO WORLD No. 8, dated May 2, concerning fire underwriter laws on radio installation.

* * *

Where is station WRW situated? His signals are very strong down here—in fact, as good as WJZ.—Paul Hoffman, Lynbrook, N. Y.

Station WRW is located in Tarrytown, N. Y.

* * *

Trying to make a regenerative set, I put tickler in main inductance, and am puzzled as to how last two sections of 20 turns, are connected.—Morris Siegel, St. Louis, Mo.

Make the large group of turns the primary, in series with a variable condenser, aerial and ground. The two small sections are your secondary and should have a variometer in series to form the secondary circuit which connects to grid and filament of tube.

* * *

Are all sets made, either crystal or tube, regenerative?—Howard Marks, Phoenix, Ariz.

Not by any means. A regenerative set has some means for transferring a small amount of the energy flowing in the plate circuit of the detector tube and back again to the secondary tuning circuit whence it is again impressed upon the grid. This renders a set over 100 per cent. more sensitive.

* * *

Could I use No. 28 double cotton-covered wire if the coil is wound with No. 24?—Benjamin Miller, New Caanan, Conn.

What do you want to use this wire for? No. 28 is too small for the aerial or ground leads, although it could be used for connections.

* * *

What will be the wave-length range of a tuning coil about 4 inches in diameter and 15 inches long? How far can I hear with this set?—Reader.

The tuning coil will tune up to about 650 meters. No absolute figures can be given regarding distance.

The radio religious service will never be popular, because the women can't see each other's hats.—Washington, D. C., "Post."

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Receiving on Steam Radiators and Pipe Lines

THE latest scheme for receiving radio messages involves the use of a good steam radiator, or a hot-water radiator, for that matter, according to a report reaching the radio section of the United States Army. This system, said to have been evolved and tested out satisfactorily by a former electrical engineer of the Signal Corps, has evidently a market value, as the inventor is reported to have sold out his circuits and patents to a big corporation for a large sum of money.

Many curious forms of receiving apparatus have already been used in lieu of the usual aeriels, some of them with remarkable success by well-known experts. Among the unusual types of aeriels employed are: the "tree antenna," demonstrated some time ago by Major-General Squier; the bed-spring antenna used by several experimenters, a trough of water and a cake of ice employed in Signal Corps experiments a year ago, and smaller and more handy devices such as umbrella and fish poles. But the latest device for this purpose, should interest many fans as it is so readily available and should prove useful, if practical.

"Antenna Still a Mystery"

Editor, RADIO WORLD: In your issue dated May 27th the contributor of the article, "Antenna Is Still a Mystery," states that "the T aerial is not particularly good for receiving." As a professional radio operator of several years experience, I wish to protest against so unqualified a jan. Fully ninety per cent. of the vessels equipped with radio, in the British mercantile marine, which it is my privilege to serve, carry aeriels of the T type and, in your own merchant fleet, I have not observed any preponderance of the inverted L aerial. Listen! On a loose-coupled, two-circuit, molybdenite crystal receiver, with a twin-T antenna, 250 feet long and 100 feet downleads, I have taken time signals from Eiffel Tower, Paris, at 2,800 nautical miles; have copied Poldhu's press at 2,530 miles; Arlington time and weather signals at 2,490 miles; and have read Cape Race, Newfoundland, while off the Azores. These are a few typical results achieved on the maligned T aerial; and if such can be done with telegraphy, I know of no reason why that type antenna cannot be employed equally advantageously for telephony signals.—C. J. Kariff Enfield, chief radio officer, Steamship "Ningchow," New York.

THE FIRST RADIO APPEAL TO FIND A MISSING MAN has been sent out by the Knights of Columbus. Jim (or Jacques) Monserrat, formerly a United States sailor, also a radio operator, has been missing from his home in Washington, D. C., since June 1921.

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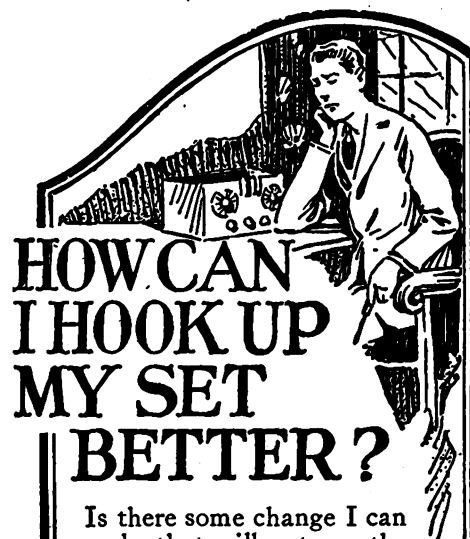
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Union College Claims First Broadcasting

RADIO broadcasting was introduced
to the people of Eastern New York
State by the Union College Radio Club on
the night of October 14, 1920, when phono-
graph music was sent through the air to
people within a 100-mile radius of Sche-
nectady, N. Y., home of the college. For
the next two months this station, conducted
entirely by college students, was the first
one in the United States to regularly
broadcast musical programs. This is the
statement of Lewis B. Sebring, Jr., a stu-
dent in the college, in his correspondence in
the New York "Tribune." Soon after the
start of the first commercial broadcasting
station the Union radio operators added to
their weekly concerts complete Sunday
night church services, with college pro-
fessors giving the sermons.

Although radio work is entirely outside
the regular curriculum followed at Union
College, it has grown in importance until
at present it is considered one of the fore-
most activities at the institution. Since
they sent out the first program in 1920 the
students have succeeded in reaching, via
the radiophone route, practically every
State in the Union east of the Mississippi
River and north of the Carolinas, to say
nothing of many provinces in Canada, and
ships far out on the Atlantic.

The old license 2XQ, which became fa-
miliar to hundreds in the vicinity of Sche-
nectady, has been supplanted by license
WRL, under which the college is now
broadcasting regular Sunday night educa-
tional programs. The weekly programs are
now such as might be expected from an
educational institution.

Smile Sparks from Antenna

IKIN remember when the music in the
heir was broadcast from the woodshed.
—CINCINNATI, O. "ENQUIRER."

"Listening in" with the radio is bound
to bring ears back into style.—YOUNGS-
TOWN, O., "TELEGRAM."

"I do not like the radio," said Ezra Ar-
thur Hines; "Tis much more fun to listen
in upon the party lines."—PORTLAND
"EXPRESS."

The pleasure of receiving the box score
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walls or opening the windows.—"TOPICS
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there's some fast sparking.—COLUMBUS,
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The only objection some people find in
the wireless telephone is that it furnishes
a reason for staying at home.—SOUTH
BEND, IND., "TRIBUNE."

Spiffins is the most henpecked man in
the world. His wife makes him put on
evening clothes to stay at home and listen
to a radio concert.—MONTREAL, "HE-
RALD."

If these wireless telephones keep on, a
man's wife can talk to him no matter
where he goes.—GREENVILLE "PIED-
MONT."

When Shakespeare wrote, "Thou wilt
not trust the air with secrets," the radio
had not been invented.—BIRMINGHAM
"AGE-HERALD."

What are the wild waves saying? Get
a radio and find out.—INDIANAPOLIS
"STAR."

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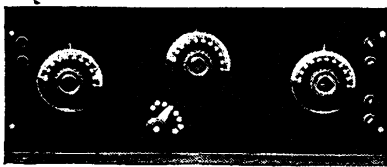
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Broadcast Bill's Radiolays

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MY wife says she can't figger out, what's got into me—in the evenin's now I stay at home as quiet as can be. I used ter like ter hang around an' swap yarns at the store with Abe an' Jim an' Peter Deets, an' half a dozen more. But times have changed, in evenin's now when all the milkin's done, the horses bedded down for night, I'm ready fer some fun. I get my rubber ear muffs out an' clamp 'em on my dome, there ain't a man in Brussels Sprouts could budge me from my home. My Aeriola's workin' fine, and gosh I like to lissen; at that it makes me cussin' mad to think what I'd been missin' before I got this set of mine with all its knobs and dials; it's changed the outlook of my life, and filled me full of smiles. No more



a fit of lonesomeness or aching heart I'll have—no, I ain't advertisin' some new liniment or salve—it's been a ray of sunshine in my home, take my advice an' buy yourself a wireless set, you'll find it worth the price. Now Willie—that's my oldest boy—has been laid up with mumps; he got so discontented, spirits way down in the dumps, that I suggested to his ma, to cheer him up a bit, I'd get the set connected in his room so he could sit right there in bed an' lissen to the whole dern universe. It wa'n't a bad idee; anyway, I've seen much worse. We didn't have no trouble keepin' him up there in bed; I caught myself a wishin' too that I was there, instead. So, if your folks are sick in bed or feelin' sort er blue, just get a set, connect her up, that's all you haf to do; old Mother Nature does the rest, an' there's no doubt that radio's the thing you'll never be without.

The Wireless Widow

I'VE been a widow all my life;
That is, since I have been a wife,
Communing with myself, the time,
In solitary pantomime.

Golf claimed him almost every day,
And, as he niblicked on his way,
I followed in his gallery
Or, on the club house porch, drank tea.

At night, Bridge took him from my side;
I couldn't play it—though I tried;
But sat at home with ill-content,
The while he gambled with the rent.

He gave up both. Said he: "I'm through,
I'll stay at home alone with you."
But Radio's got him. Fickle men!
And I'm a Widow once again.

George Mitchell in "Judge."

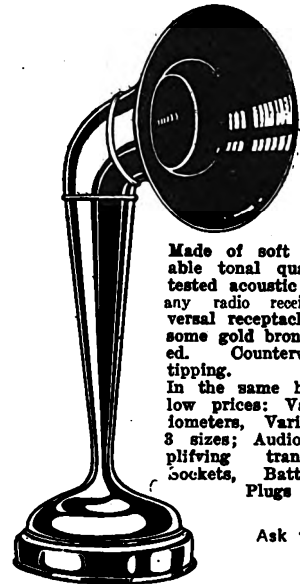
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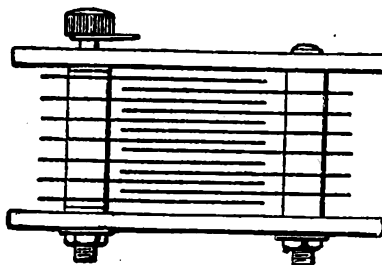
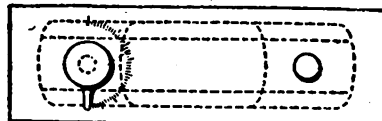
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22	.31	.88	.41
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26	.35	.50	.56
28	.40	.62	.70
30	.42	.75	.80
23 Single Silk, \$0.50 No. 40 S. O. C. \$1.65			
Variometer rotor and two stator sections			
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Send 5c for bulletin Radio and Electrical Supplies.			
Send 40c for instructions how to construct your			
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NEWCO RADIO & ELECTRICAL SUPPLY CO.			
STRATFORD, CONN.			

Old Safety-Razor Blades Will Make a Condenser

A USE has been found for discarded safety-razor blades—a problem that has been puzzling self-shavers since safety razors came into popularity. And although an American invention, a Frenchman has given to the used blade its new lease of life. He finds that a most efficient and inexpensive condenser for a radio set may be constructed from these articles, as shown in the accompanying diagram from *La Science et la Vie*, Paris. This magazine says: "It is very difficult to determine in advance the capacity of a condenser, especially when used in small radio receiving sets. While it is easy to obtain precise regulation of the self-induction placed in the circuit in a similar way, by means of a runner of some sort which varies the number of coils on the spool that come into play, it is a little more difficult to construct a condenser the capacity of which can be regulated at will.

"It is well known that a condenser is made of plates of a conducting metal alternating with insulating plates or dielectrics, and that the capacity of the apparatus is a function of the surfaces that



Schematic diagram showing how condenser is made.

face each other as well as of the thickness of the dielectric. The razor blades, then, will form the conducting plates and the air will serve as a dielectric.

"To construct this instrument, mount between two plates of fiber a number of blades varying with the maximum capacity to be obtained. Mount them immovably on a conducting axle rivetted to the frame. A second set of blades must be mounted on another axle in such a way that they will pass freely between those which are fixed, taking care that the thickness of the layer of air forming the dielectric shall be as thin as possible.

"The apparatus is complete when a corrugated button is mounted on the end of the axle carrying the movable blades, so that these can be turned to vary the capacity of the condenser at will. A pointer fixed under the button and a graduated circle on the frame will make it easy to regulate once for all the position in which the blades are to be turned, in accordance with the sending station which it is desired to hear."

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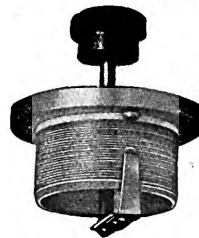
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WHOLESALE AND RETAIL

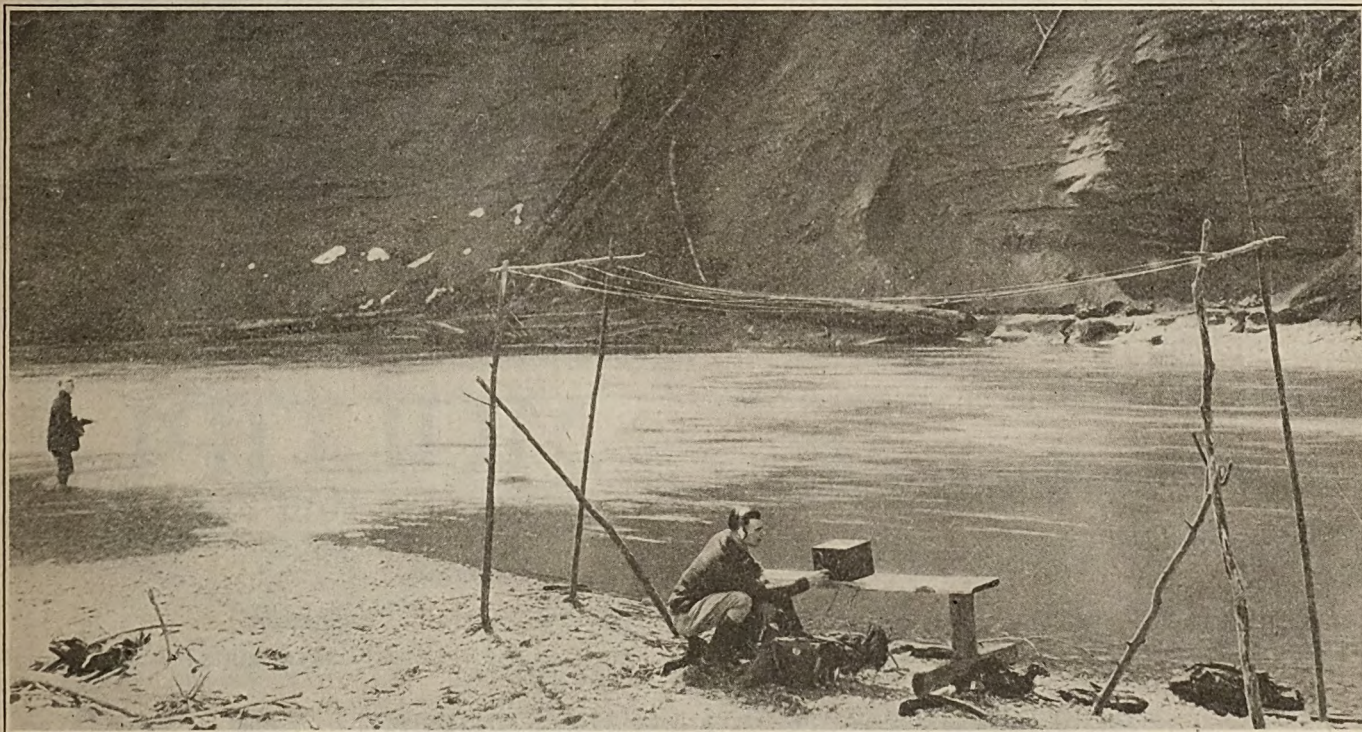
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RADIO WORLD

Entered as second-class matter, March 28, 1922, at the post office at New York, New York, under the act of March 3, 1879

I L L U S T R A T E D

The "Lone Fisherman" of 1922



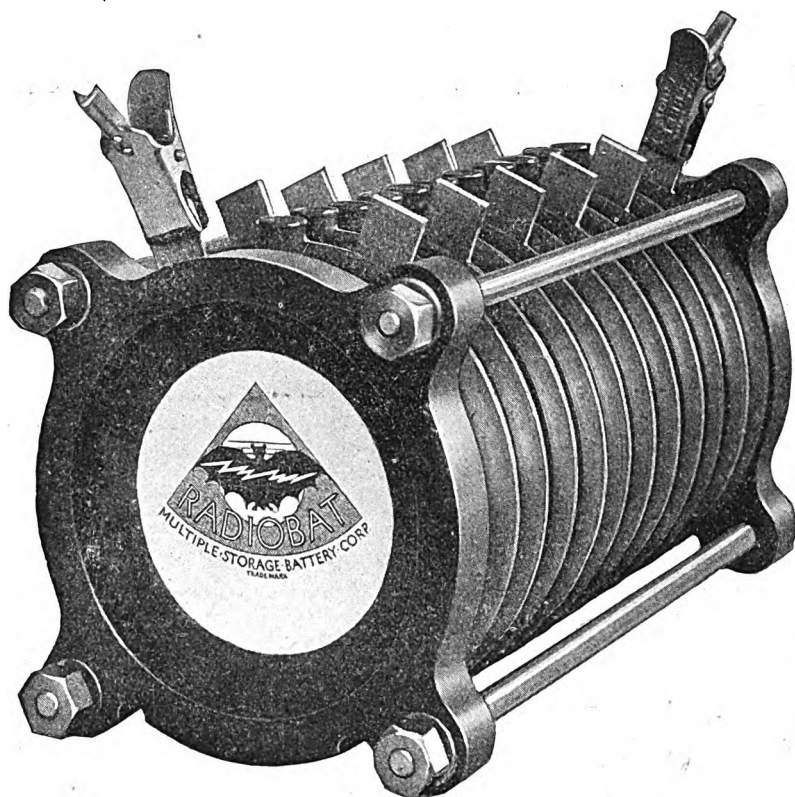
(c. International Newsreel)

When Izaak Walton wrote his literary classic, "The Compleat Angler," away back in 1660, or thereabouts, he produced what has been, since then, the allegory of peace of mind and recreation and gentle solitude that are the greater part of the fine sport of fishing. But the genial philosopher did not reckon with many things—among them the possibility of radio taking part in most everything in the world, even the art of angling. No longer does he who invades the haunts of the finny tribe seek absolute solitude, as the photograph illustrating our front cover indelibly proves. Here, on the secluded banks of the Green River, Washington, where trout fishing is a real sport, the nimrod has erected his aerial and hooked-up his receiving set, ready to hear all that is going on in the faraway world while awaiting the glory of a "bite."

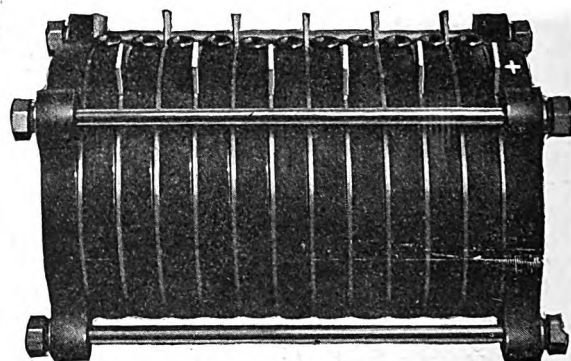
Tests of Inductance Coils—The Vacuum Tube's Start

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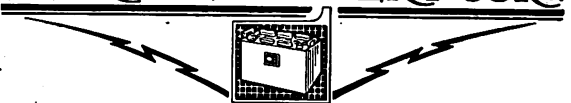
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RADIO WORLD

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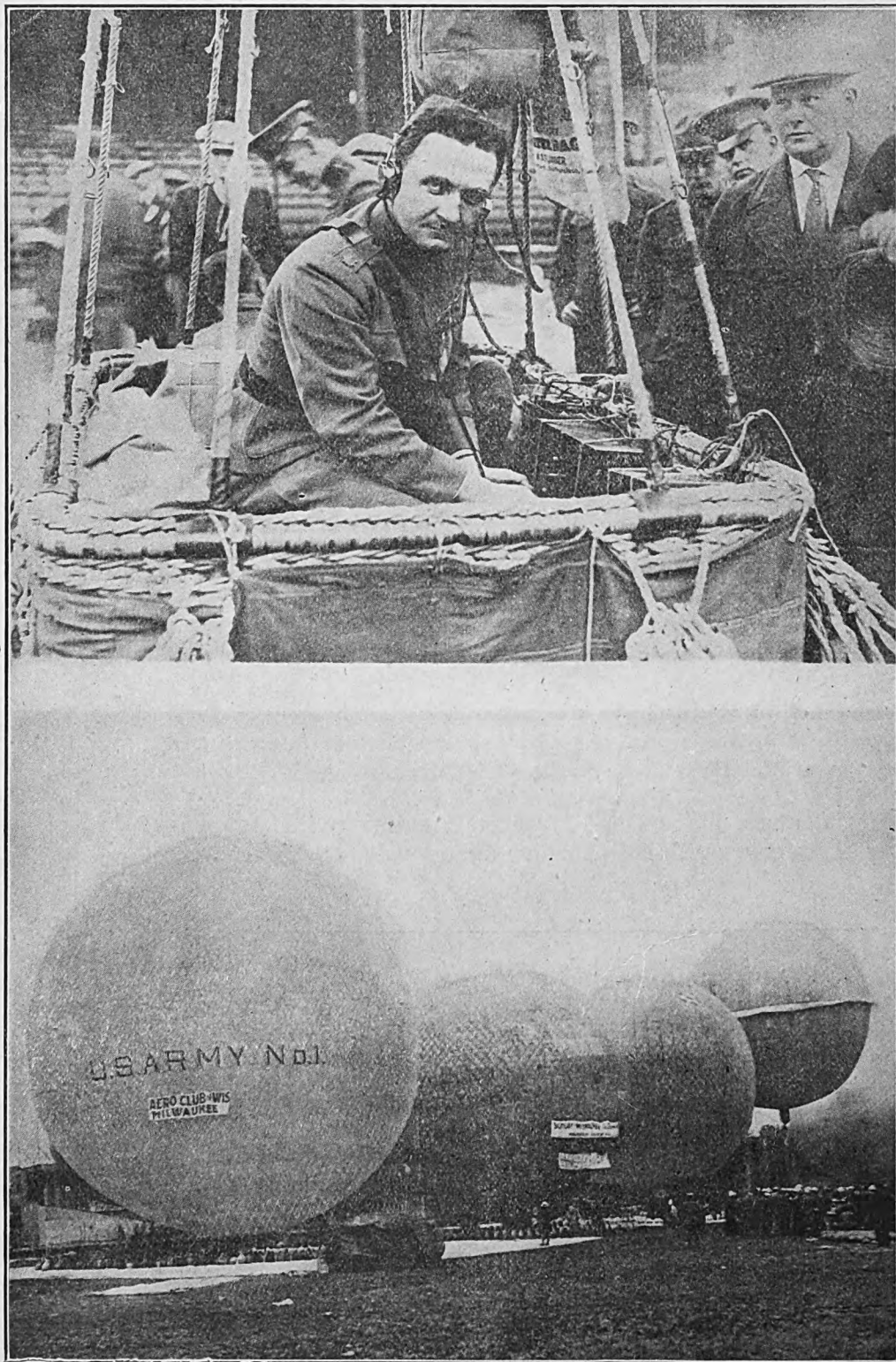
A WEEKLY JOURNAL, PUBLISHED EVERY WEDNESDAY AND DATED SATURDAY BY RADIO WORLD COMPANY, FROM PUBLICATION OFFICE, 1493 BROADWAY, NEW YORK, N. Y.

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June 17, 1922

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Big Army Balloons Race Through the Ether with Radio as Their Rudder



(c. International)

THIRTEEN entries were accounted for, prior to the great National Balloon Race which took place from Milwaukee, Wisconsin, on May 31. Out of this number, ten balloons were forced to land, leaving only three able to keep up the pace. Now that radio has taken such a prominent part in all aerial matters, the balloons were equipped with receiving and transmitting sets.

This meant that, from the start, direct communication was possible at most any minute in case of mishap or a call for emergency.

As the balloons were traveling across the wind-swept heavens, advice regarding weather conditions were broadcast to them. The broadcasting also enabled the officer in charge to keep in touch with land stations, and he was also in touch with amateur stations in case a landing had to be made.

In the upper photograph is shown Major Oscar Westover, U. S. A., of the Balloon Service. Below are several of the big gas balloons. The first three pilots to drive their balloons the greatest distance from Milwaukee are to be entered in the International Balloon Races to be held in Switzerland later this year.

Several of the pilots quit the race because they could expect no favors from the winds and wished to hold the distance they had covered. These included Ralph Upson of Detroit, one of the seven civilians shot high into the sky at the hop off. He descended near Painesville, Ohio, when shifting winds threatened to start him back over the crooked course his bag pursued.

Warren Rasor of Brookville, Ohio, another independent flier, came down near Fulton, Mo., rather than spend another night in the air. He landed only a few miles from the spot where J. S. McKibbin of St. Louis had descended shortly before.

Lieutenant James T. Neely, army pilot from Ross Field, Cal., dropped to earth near Dover, Ohio.

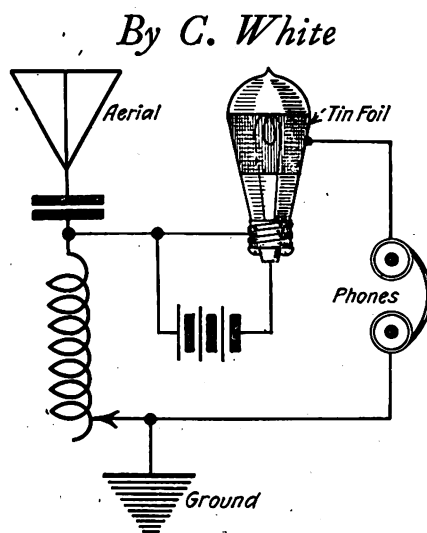
The bags which reached a high altitude after the hop off at Milwaukee, had much the same experience with air currents, and after following a course which would have taken them up into the Canadian wilds, shifted with the winds and crossed Lake Erie.

The Vacuum Bulb's Start in Life

MANY users of the vacuum bulb no doubt think of it only as of comparatively recent origin; but, in fact, the theory of the vacuum bulb has been known to science since 1883. About that time, Thomas A. Edison noticed a peculiar darkening of the lamp bulbs after considerable usage. This was a challenge to the famous inventor to discover the real reason for such blackening. Mr. Edison learned two important facts from his observations: first, that many bulbs were blackened all over except for a fine white line in the plane of the lamp filament; and, second, that it was always the side of the filament connected to the positive terminal of the line that cast the shadow. The most natural hypothesis advanced was that small particles were given off by the negative side of the filament and bombarded the positive leg. These small particles have since been called electrons. On their peculiar property of traveling from negative to positive, and not from positive to negative, has been founded the whole underlying theory of the vacuum tubes of to-day.

The next step in the development was the interposing of a metal plate or shield between the two legs of the carbon filament. Now we know from the general theory that a current will flow from the positive side of the lamp to the plate if we should place a wire between the two leads from the same on the outside of the lamp, but no current will flow if a wire be placed across the negative side and the plate. This is readily explained by the fact that, within the bulb, electrons, passing from the negative leg to the positive, hit the metallic plate thereby inducing negative charges. Therefore, when the positive side is connected to the plate terminal exterior, to the bulb, a current will flow because the two terminals have opposite charges on them. Of course, when a wire is connected across from plate to negative leg, no current will flow since both terminals have negative charges. Now, if an alternating potential be applied to the lamp, current will only flow through a wire connected from the plate lead to one end when that end has a positive charge on it. This action is called the rectifying action of the tube. A common application is the mercury arc-rectifier and the tungar rectifier.

Professor J. A. Fleming changed the shape of the plate into a shield around the filament and gave it the name of the "Fleming Valve." The Fleming valve was nothing more than the old Edison two electrode—the filament



Schematic diagram of the simple valve designed by Dr. J. A. Fleming. Suggested by C. White. Drawn by S. Newman.

and the plate—tube with its design changed. The rectifying action of the two-electrode tube found application as a wireless detector, and was used as such extensively by the Marconi Company before the advent of the superior three-electrode bulb of to-day. The trade name for the two-electrode bulb is Kenotron.

Dr. Lee DeForest made the final big step in the development of the vacuum bulb when he introduced a third electrode known as the grid. The action of the grid may be described briefly as follows: If between

the heated filament and the plate we place a B battery with the positive side attached to the plate, a flow of electrons will start from the filament to the plate; and, if we interpose a grid or sieve, naturally the electrons will have to pass through it to reach the plate. Of course a positive charge induced on the grid will accelerate the passage of the electrons while a negative charge will retard the passage, thus varying the external current in the plate circuit. When the three-electrode tube is used as a detector of radio waves, the varying pulse of the incoming wave is connected across the filament to the grid. This variation of charges on the grid alternately accelerate and retard the passage of electrons to the plate thus producing a change of current in the phones which are connected in the plate battery (B battery) circuit. Although the change on the grid is small, the total result of the change in the phone circuit is very large. It is this fact that makes the vacuum bulb a very effective detector of radio waves.

As an interesting experiment, I would suggest that those who love to delve into the scientific side, try the following: Take a small miniature bulb (4 or 6 volt size) and silver or coat it with tin foil. If a battery be attached to heat the filament and the whole affair be connected in a circuit, as shown in Figure 1, an efficient Fleming valve detector may be had.

Radio Corner of a Passenger Car



(c. Underwood & Underwood)

This is the radio corner of a passenger coach on the Lackawanna. The reception of radio messages is now an accepted fact on several railroads. Soon it will become a regular element in the life of all travelers.

How to Select the Right Set

By E. L. Bragdon

IT is said that a large percentage of motor-cars are sold through the color of the body and wheels and the design of the lines. The engine and driving mechanism are considered merely as an incidental.

The beginner in radio is probably buying the most of his equipment on the basis of the number of dials, the size of the cabinet, and the mahogany finish. It could hardly be otherwise when an industry springs into being with the rapidity of radio. Moreover, it is idle talk to argue that the beginner may be shown in a few minutes just what he needs for an outfit. But a few pertinent facts about the kinds of sets available.

In the hope of reaching as many possible users of radio sets as manufacturers could meet with their supply, only three classes are formed:

1.—The man who lives on the third floor of a six-floor apartment house, or hotel, and is, thereby, prevented from having an aerial on the roof.

2.—The average amateur who lives where a wire can easily be strung from house to tree.

3.—The radio beginner who lives in a remote district, many miles distant from a broadcasting station of any kind, and whose very position makes him a fitting prospect for an outfit which will bring to him regularly and clearly the daily news of the world.

Practically every city of size in the country now sports one or more broadcasting stations, and as a six-story apartment house, or hotel, sug-

To the Amateur

Buy the very best outfit you can afford. You can find plenty of space to erect the ideal aerial; say, 150 feet in length and 75 feet in height.

With this antenna to pick up the ether vibration, and a good outfit to convert the waves into sound, your enjoyment is guaranteed. Nothing would then be too far away to be your own.

Using two stages of radio-frequency amplification and one or two of audio-frequency amplification, you should be able to tune in any broadcasting station doing business in this country.

And it is doubtful if the seeming maze of amplifications would be at all mystifying to you.

gests such a city it can be assumed that the beginner who lives on the third floor of one of these houses would be satisfied at the start if he were able to hear the local stations. The distance is short; but on account of having no outdoor antenna, the capacity of the receiving set must be greater.

Although the ordinary loop aerial consisting of ten or a dozen turns of wire about a four-foot frame is the more compact, the writer favors coil aerial formed by laying four or five turns of wire behind the picture give slightly better results if separated

one strand from the next, but excellent results have been obtained with the strands placed helter-skelter behind the molding. Only one end is used, the other end hanging free.

With an antenna of this type, the owner needs only a single vacuum-tube detector set, hooked up with what is known as the "regenerative circuit," to listen in on all the more powerful broadcasting stations within a hundred miles. Because of the fact that every part of the equipment is forced to work at its maximum efficiency, a radio receiving-set with as few fixed circuits as possible is to be preferred. That is, a set should not be purchased which has a fixed tuning-coil, but which provides a variable condenser for variations in tuning.

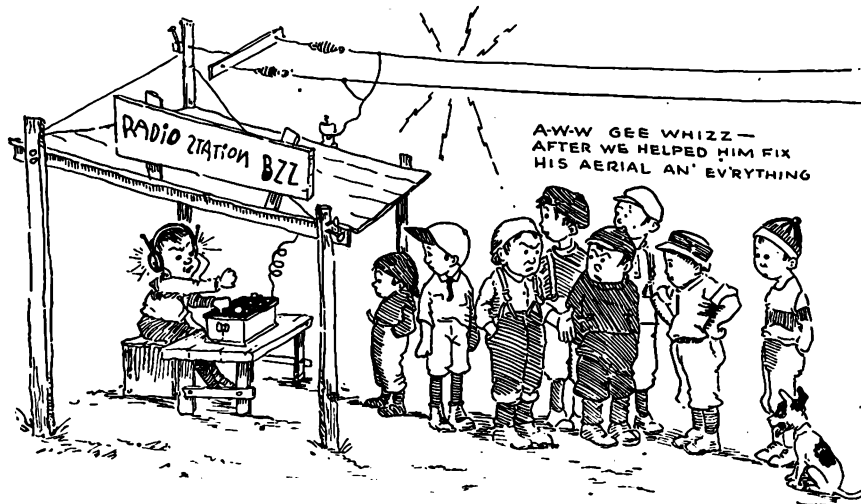
A crystal detector set should not be considered for use with indoor antennas, even though many instances have been reported where truly astonishing distances have been covered with similar layouts. It is always better to play safe and secure a single-tube outfit with a regenerative circuit. Success is then assured. A set of this description should not cost more than \$100, including all incidentals such as storage battery, dry battery, and phones.

Compared with his shut-in brother of the apartment, the radio amateur living where an outdoor antenna may be raised has a simple proposition. A single copper-wire strung between two points 75 to 100 feet apart, and as high in the air as facilities permit, will make as good an aerial as he will need whether his outfit be the most simple or the most intricate.

If this man is living within twenty-five miles of a broadcasting station, and does not feel wealthy enough to invest in one of the better grades of receiving set, he will get really satisfactory results with one of the simple crystal-detector sets costing not more than \$18 to \$25. Nothing has yet been found that will beat a crystal detector for picking up radiotelephone sounds. Its range, of course, is limited, but what it gets is without a semblance of distortion. There are several types of crystal outfits. In some of them, there is little beyond a detector, a phone, and a crude coil. The tuning is carried out by taps terminating in switches. Close tuning is impossible. Amateurs sending code are apt to break in and ruin an evening's entertainment. If this happens

A Corner in Radio

Cartoon by H. C. Diefenbach



Radio World's Hall of Fame



(c. Underwood & Underwood)

DR. LOUIS COHEN

Discoverer of the Cohen capacity coupled-receiver used in all government radio stations. Dr. Cohen is connected with the George Washington University, Washington, D. C., and the Bureau of Standards. With Major Mauborgne of the United States Signal Corps, he invented a device which, it is claimed, will eliminate static. It is called "The Drain Coil."

(Continued from preceding page)
the only recourse is to shut down for the time being. Other outfits are made up of a very good design of tuner with a variable air condenser connected across its terminals for close tuning. With this set, interference usually may be ruled out, leaving the air free for the crystal set, it is best

to pay as much as the pocketbook will allow.

The man residing within a short distance of a broadcasting station may prefer a vacuum-tube outfit because of the greater latitude made available by it. Since he is in a position to do fine long-distance work, he should buy the best vacuum-tube set

on the market. A single-tube outfit with close-tuning facilities will provide a good base for future additions of amplifying units. If current literature is carefully studied, he will find that some sets, particularly those making use of honeycomb or similar coil, have a wave-length range from 200 meters up to 25,000.

The Beginnings of Broadcasting

It Has Created Over a Million Receiving Stations at a Cost of \$75,000,000

By *L. R. Krumm*

IN February 27 of this year, there was held, in Washington, an open hearing before a committee of radio engineers, military officers, and governmental representatives, appointed by the Secretary of Commerce to formulate proposed laws and regulations to meet the new radio-conditions which have developed since the termination of the World War. Nearly two hundred representatives of various commercial, amateur and governmental radio interests attended this conference.

The main purpose of this conference was to devise means to meet the problems which had arisen through the establishment of the radiotelephone broadcasting stations, which have caused the installation, during the past year and a half, of from 700,000 to 1,000,000 radio-receiving stations, representing a probable expenditure of approximately \$75,000,000.

Previous to the establishment of broadcasting stations working on absolutely dependable schedules, the public's interest in radio had been limited to the technically inclined amateur operators with some knowledge of the electrical principles involved in radio telegraph communication. These men were "dyed in the wool" faddists on radio. They wanted to know what "made the wheels go round" and how to make them go. They wanted to establish radio telegraph transmitting stations. For this it was necessary to study the Continental Morse Code and secure operators' licenses from the government. All this they did in addition to investing considerable money and time in the purchase and installation of the equipment.

It was estimated, before the World War, that there were some 6,000 licensed amateurs transmitting stations and, probably, 50,000 receiving stations which required no license. All these were closed during the war. The amateur receiving stations were allowed to re-open April 15, 1919. On October 1, 1919, amateur transmitting stations were allowed to operate again. The amateur radio activities had languished during the war period and probably there were fewer amateur stations after than before the war.

During the war, Mr. Frank Conrad, Assistant Electrical Engineer for the Westinghouse Electric & Manufacturing Company had become interested in radio work because he had given his best efforts to assist the

L. R. Krumm, Superintendent of Radio Operations of the Westinghouse Electric & Manufacturing Company, is one of the best informed men on wireless of the present day. Mr. Krumm served as Lieutenant Colonel, Signal Corps of the A. E. F.; was eighteen months in France on the staff of the Chief Signal Officer, General Edgar Russell; and had charge of all radio operations of the A. E. F. For his service during the World War he was awarded the Distinguished Service Medal by the United States, and the Legion D'Honneur by France. Mr. Krumm came to the Westinghouse Company from the Army. Previous to his service, he was Chief Radio Inspector of the Bureau of Navigation, Department of Commerce.

government in producing the very highest type of radio equipment for the Army and Navy. Practically the only type of equipment which was produced in quantity and delivered in France in time to be of any service to the American troops and which met the requirements of warfare was an airplane transmitter known as SCR-73 set, developed and produced by this company. Mr. Conrad's activities covered, however, more than this equipment, as he was interested in the development of various types of radiotelephone sets. To aid him in his experiments he was given a special license to operate, during the war, at his home in Pittsburgh, Pa.

After the armistice he retained his interest in this work, and, operating under this special license was able to continue development of his radio station to a degree of success exceeding anything heretofore attained. The Westinghouse Company, which, previous to the war, had no radio interest, also decided that a company of its magnitude could no longer exclude radio from its activities and had entered this branch of the electrical business. It was, therefore, intensely interested in Mr. Conrad's researches and he continued his work with its encouragement and assistance.

In the winter of 1919, Mr. Conrad established at his residence in Pittsburgh, a radio telephone broadcasting station and began the regular broadcasting of music and entertainment. This station was then known as 8XK, the call letters assigned in the new license he carried from the Department of Commerce. At first his efforts

were confined to the broadcasting of phonograph music every Wednesday and Friday night. Soon his supply of records was exhausted and, one night, in response to many letters requesting the latest popular music, he announced that he had exhausted his records and was financially embarrassed trying to keep up with the demand for new music. He suggested that, possibly, his hearers would like to help him out in this dilemma. He received nearly 500 records. The magnitude of the response to this appeal indicated the appreciation of his audience and the demand for its continuance.

He broadened his activities by providing a studio in which artists, instrumental and vocal, could render selections for transmission from his radio station, a short distance away.

H. P. Davis, vice-president of the Westinghouse Electric & Manufacturing Company, who was responsible for his company entering the radio field, had been watching not only the technical development of the equipment but also the attitude of the public toward broadcasting, realized the necessity of providing this service in a systematic and properly organized manner as a part of his company's business operations, and, therefore, in the fall of 1920 began the construction of a broadcasting station at the East Pittsburgh works. Through Mr. Davis, therefore, more than anyone else in the country is due the credit for starting broadcasting on a nationwide scale. He was the first man to sense the tremendous importance of the radiophone.

Experiments were carried on for several weeks previous to election night in November, 1920, when it was intended to inaugurate this service by broadcasting the election returns. A special license was obtained from the government radio inspector in Detroit, Michigan, and the call letters 8ZZ were assigned to the station in the beginning. The election results were startlingly satisfactory and the letters of appreciation received by the company dispersed any doubt as to the advisability of continuing broadcasting. Plans for the improvement and enlargement of the station were immediately inaugurated and regular nightly programs were announced with specially selected artists as entertainers. A wave length of 330 meters was originally assigned to this station.

"I believe that radio is absolutely necessary to the future of the world."—MARCONI.

Hook-ups

By *Albert P. Taylor*

IT may be all right for a physician to equip his car with a receiving set. He needs a little recreation between calls, anyway, and that seems an excellent way in which to get it. Several good songs over the ether should brace him for the next call on a colicky baby. How about the dentists, though? If a former proprietor of a tooth or two left with the "painless extractor" were to own a sending outfit, he'd likely shut himself in his room and confide to the 200 meters at his disposal a few reassuring remarks about "that D. D. S., with his C-W steel pliers." On the other hand, it would help some while the drill is making contact with a bare nerve to have a loud-speaker nearby rendering, "One Sweetly Solemn Thought." We advocate radio sets for all physicians and dentists. Even chiropractors would benefit, if "the daily dozen" were on the air.

* * *

Don't you think theatrical producers and managers of singers should make exceptions to their ruling against broadcasting by their stars? If one could listen to some of them and not see them, it might help a lot. A beautiful voice is frequently transmitted from a rather homely "set."

* * *

Here's a new one: Broadcasting of church services is not new, but have you heard of a church advertising free radio concerts? We have. The pastor of a small country-church organized a radio club among the boys with a girl's club about to organize. Well, everybody was invited to a free radio-concert given in the church—and they came! Might help some other churches to try this.

* * *

We are informed, on pretty good authority, that there'll be receiving sets installed in offices of some of the baseball managers this year. What's the use, after all, of lettin' the bleachers see just how you feel, when the "Pigmies" are swatting your "Cherubs" all over the diamond. Radio has a good many redeeming features.

* * *

Had a new "fan" stop us the other day to ask, "Which of the radio magazines do you consider the best?" He seemed to think there were a good many to choose from. We convinced him, however, that the magazine you

are now reading "brought in everything full and clear," and that he could "receive" every week. Of course, with the interest of **RADIO WORLD** at heart, we didn't advertise the fact that we have a line or two in it.

* * *

When Paul Godley has something to say, most of us listen in. This time he was speaking of radio's bearing on political parties. Seems like there are a few little issues between the camps now; but if, as Godley says, the time may come when the popularity of a political party will depend on the character of its broadcasting policy—! Well, all we can say is, there'll be quite some folks knowing what they are voting for.

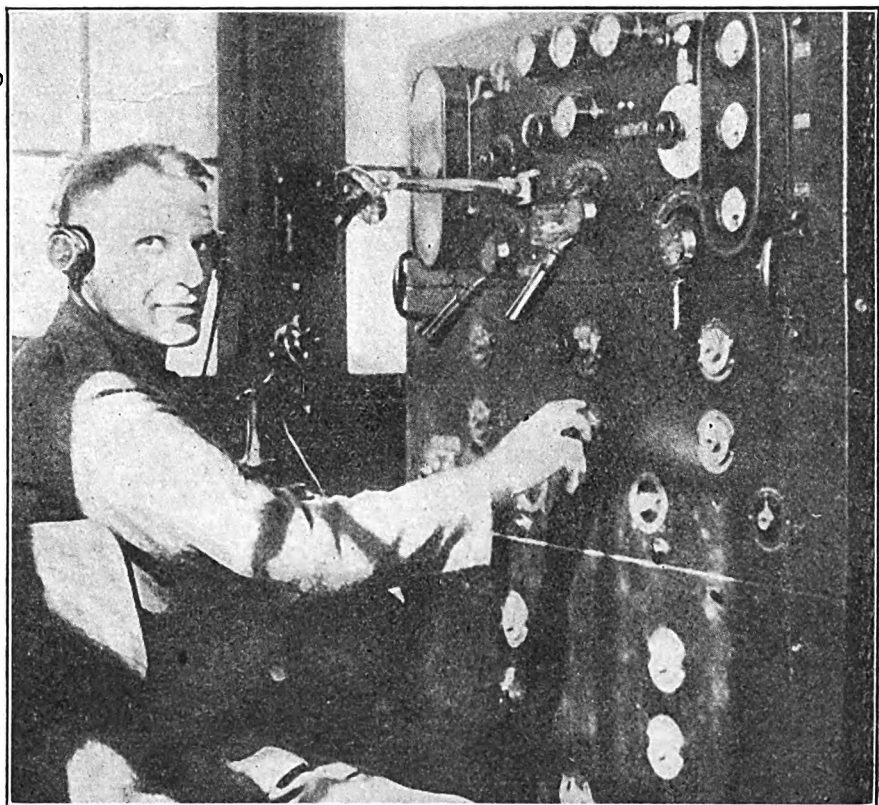
* * *

Haven't heard of any date set for the old-timers' feed—have you? If it does come off there sure will be some "interference" in the banqueting hall.

Resonance Is Essential to Good Tuning

AS stated, high frequency currents are seriously affected by resistance, more so by far than low frequency alternating currents such as are used in house lighting systems. If an inductance is placed in the circuit by itself the opposition of the coil to the radio-frequency currents is so great that the current flow through the receivers and detector would be too small for detection. This objection or opposition of the inductance coil is called reactance. Fortunately though, the reactance of inductances and condensers are of different kinds. They can be called positive and negative for ease of explanation. It follows then that if the inductance applies too great an opposition in the form of reactance, we can add some condenser capacity and gradually overcome it. By increasing the reactance of the condenser, we come to a point where the capacity and inductance are exactly opposite and equal. The high-frequency currents can then flow through the circuit with practically no opposition. When this point is reached, the circuit is in a state known as *resonance*. Resonance is essential for tuning.

The Mighty Transmitter at the Presidio, California



(c. International Newsreel)

One of the largest radio stations in the world is now in operation at The Presidio, the United States Army Reservation at San Francisco, California. This station has the power to transmit a message more than half the distance around the globe. The operating board is photographed in clear detail. A sergeant is in charge of the controls.

The Radio Primer

A. B. C. for the Beginner Who Must Have the Facts Put Plainly and Tersely, and all Terms Fully Explained

Revised Radio Dictionary

RADIO WORLD begins, with this number of THE PRIMER, a complete revised radio dictionary. Since the first issue, we have published a number of radio terms and their meanings; but many new ones have come into being and many amateurs have joined the ranks, so that if repetitions are made, they will be appreciated, we are certain, by these readers. With this new glossary, we will present the most complete list of words used in radio, with clear and explicit meanings—a list that will enable every reader to possess an up-to-the-minute compilation of all definitions that are necessary to a thorough knowledge of radio. This will be worth preserving. Begin with this number.

Aerial—Referring to a number of wires so arranged as to receive electrical waves.

Aerial (cage type)—An aerial consisting of three or more wires suspended between two hoops instead of the usual straight type of spreads. The cage has no particular electrical advantage.

Aerial (inverted L type)—An aerial made of one or several wires in the horizontal portion with the lead-in coming from the end.

Aerial (T type)—An aerial having one or more several wires in the horizontal portion, with the lead-in coming from the center of the flat top.

Antenna—Same as aerial. Heinrich Hertz, the discoverer of electric waves, originated this term.

Alternating Current (A. C.)—A current which changes its flow periodically. (Alternates.) An electrical current in which the direction of flow is constantly changing during a period of time. Thus when we speak of a 500-cycle alternating cur-

rent, we mean one that completely reverses its direction of flow 500 times per second. The alternating current plays an important part in many phases of radio.

Alternator—An electric generator for producing alternating current.

Ammeter—An instrument used for measuring the flow of electricity through a given circuit. An ammeter is connected in series with the flow of current. When large currents are handled, a heavy conductor is placed across the ammeter proper. This conductor is known as the shunt, and permits the handling of large currents.

Ampere—The unit of measurement of the strength of an electric current.

Amplifier—A vacuum tube which adds local energy to the incoming signal. This term is used in reference to either an amplifier tube or an amplifier receiving unit. It builds up or magnifies so as to speak the waves or sounds in a receiving set.

Amplitude—The highest point reached by a wave or oscillation. The crest of a wave.

Atmospherics—Often termed "static." Stray noises in space, electrical discharges in the ether, and, in reality, minute electrical-lightning storms. It is difficult to tune out these disturbances for they have no definite wave length.

Audibility—The measurement of the strength of the incoming signal.

Audio Frequencies—Frequencies corresponding to vibrations which are normally audible to the human ear. All frequencies below 10,000 cycles per second are termed audio frequencies.

Audion—An exhausted vacuum tube containing three elements namely filament, grid, and plate.

The Beginner's Catechism

By Edward Linwood

WHAT is the function of a single slide tuner in a receiver?

A single slide-tuner enables you to change to the wave lengths desired, depending upon the wave length desired in proportion to the amount of inductance and capacity used.

* * *

What is the function of a loose coupler in a receiver?

The object of a loose coupler is to provide a means of tuning the open and closed circuits, thereby transferring the energy from the aerial circuit to the detector circuit.

Into what number of types may receiving circuits be classified?

There are four types, namely: Plain, or simple receiver; Conductively coupled; Inductively coupled, and Capacitively coupled

* * *

What is meant by each type?

The simple receiver is simply employing a detector and head phones with the aerial and ground.

The conductively coupled set is that in which a tuner, or coil, of wire is employed such as a single slide or double slide tuner.

The inductively coupled set is one

that employs two coils, namely primary and secondary. They are also called magnetically coupled sets.

The capacitively coupled set is one that employs two condensers which are connected between the primary and secondary as in the drawing. This enables the adjustment of coupling by aid of condensers.

* * *

What happens if the coupling should be tightened when using a loose coupler?

The receiver then responds to a wider range of wave lengths, because it increases the damping of the receiver as a whole.

* * *

What is the advantage of having the coupling of a receiving set so that it can be varied?

It allows the receiver to be tuned sharply. This, in turn, would eliminate much of the interference experienced from the undesired stations, even though they may be working on practically the same wave length. The different degree of damping from each transmitter is responsible for this.

Hints on Building an Antenna

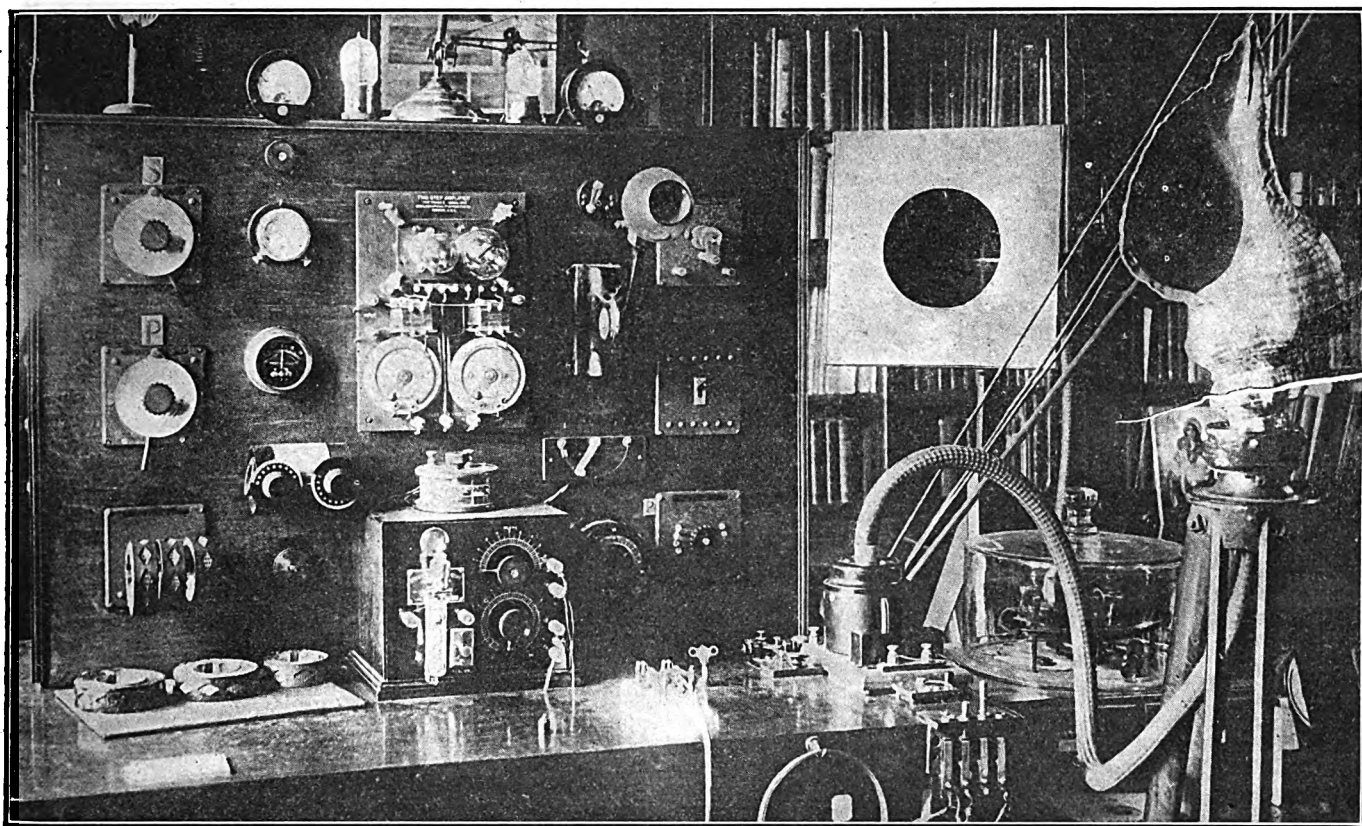
WHEN installing a receiving set for wireless telegraphy, or telephony, the following suggestions in regard to the antenna may be of value.

Care should be taken in selecting a site for the erection of the antenna. Avoid placing an antenna in such a position that its wires are parallel to lighting lines, high-tension power lines, or telephone lines. If there are any such wires near the contemplated site, be sure to erect your aerial so that its plane will be at right angles to, and so far as possible, from such wires. It is very important to observe these precautions if the best results are expected. The antenna may be erected between two trees, if available, or from the corner of a house or building. The best method, however, is to erect two masts and support the antenna between them.

The antenna may be erected at any height; and the higher the antenna the better the results. An antenna erected at a considerable height from the surrounding buildings is less liable to pick up static, which greatly interferes with the reception of radio signals.

There are numerous types of aerials for receiving purposes. The best, for the amateur, is either the straightaway inverted L type, or the

Invention Enhances Quality of Music



(c. Ewing Galloway, N. Y.)

Horn devised by Rev. Frederick L. Odenbach to kill "tinny" effects in music.

REVEREND FREDERICK L. ODENBACH, director of the Observatory of St. Ignatius College, Cleveland, installed in that institution, the fine radio set shown in the accompanying photograph. The unusual part of it is the shell-shaped horn, his own invention. This horn, is an enemy of jazz.

"With this horn attached to a receiving set," Father Odenbach says, "jazz will eliminate itself, since every sound is brought out to the smallest detail. Jazz distilled in this way is found to be one-third dissonance, one-third bad tuning, and one-third the beating of drummers gone mad. Coming out of the shell, in full force, it

will drive a cat out of the room."

Here are his directions for making the horn: For the shell, a triton, or conch shell, is needed. The tip is sawed off to give an opening about an inch and a half. The aperture is winded out at the sawed point, up the winding cavity, until, at the smallest, it is about the size of a finger. Fit it on a block of wood in order to hold it solid, then attach a rubber hose and run the hose to a magnavox attached to the radio receiving set. A garden hose will do. The anatomy of the human ear gave Father Odenbach his basic idea for the horn.

For concert halls, Father Odenbach has perfected a pyramid horn of

thin wood, which is seen next to the shell horn. This horn is not quite so clear as the shell horn, but it is a splendid magnifier. For the wood horn, he constructed a truncated pyramid, two inches square. All four sides are thin, shellacked wood; the opposite sides are of pine and two of maple. Connect the opposite sides by thin slivers of wood fitted into the interior. Over the mouth is fitted a thin sheet of wood with a round hole, six inches in diameter; slabs such as are used behind pictures in frames are best for this purpose. A rubber hose is run from the small end to a magnavox. The vibration of the wood acts as a sounding board

(Continued from preceding page)
T type. These aerials receive their name from the method of connection of the lead-in wire. In the inverted L type, the lead-in wire is taken from the end of aerial. In the T type, the lead-in wire is taken from the center of aerial.

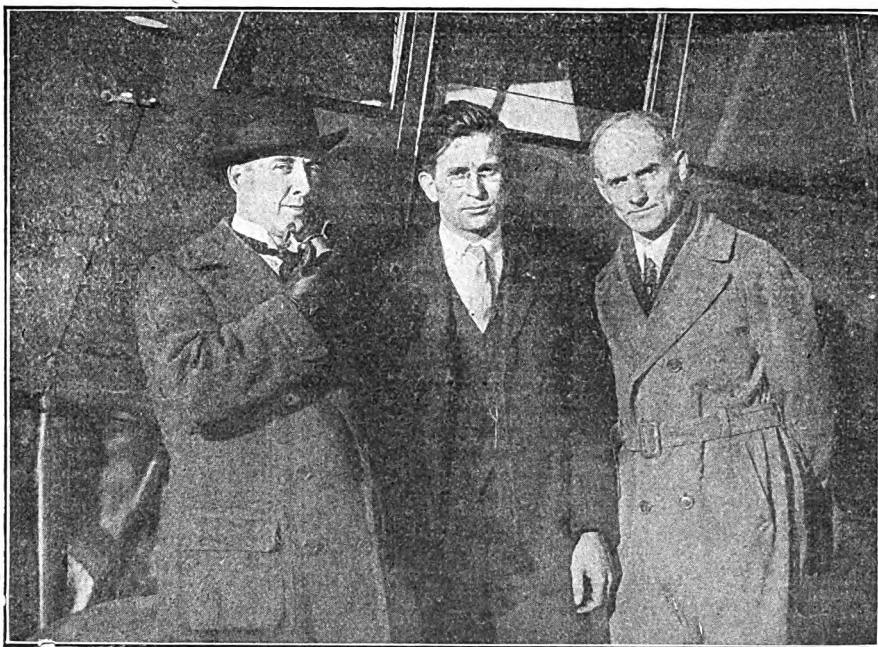
The aerial may consist of a number of wires. While a one-wire aerial will give excellent results for receiving purposes only, an aerial consisting of two or four wires has greater capacity and is to be preferred. If it is

desired to receive from short wavelength stations, I suggest that aerial be not more than 100 feet in length. Another important feature in connection with the antenna is the lightning ground-connection. All antenna should be "grounded" when not in use. An antenna properly grounded acts as protection against lightning in the same manner as lightning rods neutralizing static charges in its vicinity. A good ground connection may be made to a water pipe or if such is not available to a rod or pipe driven

into the earth in a damp spot. A single pole, double throw-switch of large capacity should be placed in circuit between the aerial lead and the ground connection, No. 4 stranded rubber-covered wire being used for connection from the ground switch to the ground connection.

A ground connection must also be provided for the instrument. This may be made on a water pipe, a radiator, or any metal which is a good conductor of electricity and which is also connected to the earth.

He Preaches from the Skies



(c. Underwood & Underwood)

Lieutenant Belvin W. Maynard, U. S. A., the noted flying parson who preaches occasionally a sermon by radio while up in his airplane. This illustration shows a huge Fokker plane equipped with an installation comprising a General Electric Company's 100-watt tube transmitting set, by which his sermons are sent out by radio. The receiver used was made by E. W. Dannals, a well-known Navy radio expert. On one flight to Albany, communication was intercepted and sent to the flying field at Mineola, L. I. Mr. Maynard said that WJZ was heard plainly at Troy at a height of 1,000 feet. The photograph also shows Bernard Ferguson (left) baritone singer, who sang from the plane, Mr. Maynard (center) and his assistant W. H. Sobey alongside.

Gridless Tubes

SOME vacuum tubes work best without a grid condenser and leak. To a certain extent, this depends on the "characteristics of the tube." This is a phase that seems hard to understand, but, really, it is not. It has to do with the actions of the tube when the current and voltage on plate, grid, and filament are altered. Some tubes must have a certain quantity of voltage and current on the principal elements before they will act as detectors. Sometimes the grid should be positive; sometimes negative. The use of a grid condenser is dependent on these variables.

A good many tubes will work equally as well with or without a grid leak. This is due to a point of the negative charges of the grid whether they glide off through a 35-cent grid leak especially made and designed, or through an attractive path in the tube itself. If the insulation around the base of the tube is none too good, the charges will trace their way in that manner. Sometimes the grid condenser is mounted on a poor insulator, thus providing, without special arrangements, a good grid leak.

Tests of Inductance Coils

By Fred. Chas. Ehlert

COILS of wire are wound in many different ways, but all constitute what is known as an "inductance coil." The study of such coils has been made in circuits carrying direct currents, or alternating currents, of low frequency such as 60 cycle. At such low frequencies, the same number of amperes flow in every part of the wire constituting the inductance coil, and the distribution of the current over a given cross-section is practically uniform. At high frequencies, the current density is not uniform over a given cross-sections of a wire, nor is it the same for different cross-sections of the wires.

The current flow is modified by induction effects of magnetic as well as electro-static nature. For direct current, the resistance coils can be determined by Ohm's law; but, at radio frequencies, Ohm's law by no means gives complete information regarding the resistance of a coil. The study of the non-uniformity of current density in a particular cross-section is known

as "skin effect," and considerable work has been done on this subject. The difference in the current flowing across different cross-sections of the wire forming a coil are caused by the capacities distributed along the winding of the coil.

An inductance coil behaves in an electric circuit primarily as an inductance. The potentials of the different parts of the coils are, however, different from each other and from the potentials of the ground. For this reason the coil behaves also to a certain extent as an electric condenser, or rather a system of condensers. The impedance of these capacity paths is low at radio frequencies, and the capacities constitute shunt paths for the radio-frequency current and cause charges to collect at various points of the coil thus creating back electromotive forces. There are several effects of the non-uniform distribution of current along the wire, or which the most important is the increase in the resistance of the coil with the frequency. At radio frequencies, the re-

sistance of an inductance coil depends on the point of the coil at which an electro-motive force is inserted and the current measured.

On account of the importance of inductance coils in radio communication, careful study, both theoretical and experimental, has been made at the Bureau of Standards, Washington, D. C., on capacity effects and other effects in inductance coils at radio frequencies.

If an inductance coil is connected in series with a condenser, it is found that the true capacity of the whole circuit, as computed from the observed resonance frequency and the known inductance, is not the same as the capacity of the condenser alone. The difference largely is due to the distributed capacity of the inductance coil. A general discussion of the effects of the distributed capacity of inductance coils may be found in a leaflet by Mr. Breit, Bureau of Standards, Washington, D. C.

Every amateur should study this subject thoroughly.

Short Waves from a Simple Circuit

By Stanley Bryant

OUT in the country, where the air is free and space is not at a premium, the amateur is not limited to his aerial. It comes, for him, merely a question of how good an antenna he can afford. It is never a question as to how he can arrange for any aerial at all. But conditions are different with the city amateur. If he started late in the game, he notes with dismay that the top of his apartment-house roof already sports from two to ten aerials. There's not a chance for one of his own. At least, that is the way it seems to him.

And he thinks it over, and finally comes to the first knotty problem: "Why can't I fix it up so that Bill," the youngster on the floor beneath him, "and I use the same aerial." He puts the question to other radio fans. With one accord they say that it cannot be done. They can't tell him why, but they know it is so. And they are quite correct, but—

A few days later, the radio department of a daily paper publishes a communication from a capable experimenter, giving the surprising results of his own tests with two receiving outfits hooked onto the same single-wire antenna. With both sides of the prob-

lem before us, the subject is well worth looking into.

Here are the facts: Two receiving sets of the vacuum-tube type, each having the same general characteristics, can be attached to the same aerial with very good results; but to secure any results at all, it is necessary that the two sets be in a position where they may be tuned simultaneously. For, as one set is tuned to the aerial circuit, the second set would be detuned. It becomes, then, a question of juggling the adjustments of both sets until a point is reached in each where the reaction between them is of a certain ratio to be determined only by trial.

It is not possible for two amateurs living at opposite ends of a single wire aerial to hook onto their respective ends and get satisfactory results. If their time of operation could be dovetailed so that neither was "on the air" when the other was, then the situation would be but little different from the ordinary layout. The fact that each set was grounded would not, in itself, prevent successful operation. The longer the aerial the less effect the ground at the far end would have. But if this factor seriously

affected the reception of broadcasts, it would be a simple matter to arrange so that each station would be insulated from the ground by a vacuum gap while not in operation.

* * *

Condensers—the Handy Andy Radio Device

WIRELESS hounds who hark back to the early days when QRM was merely three letters of the alphabet, and a license something for dogs and married people, had little use for the quiet unassuming condenser found so frequently in present-day radio outfits. If the station owner was a plutocrat, he had a variable condenser of 23 plates; but, more often than not, the five or six dollar set was too great an obstacle. He would have preferred a "variable," but inasmuch as his set seemed to work without it, why worry.

But notice the situation now. There's the variable in the ground lead of the tuning inductance! There's another across the secondary of the same inductance! It's quite the thing in some circuits, to have a variable across the telephones and the B battery to by-pass the Armstrong currents, if such a term may be used.

In truth, there is more money tied up in variable condensers to-day than our old wireless sets cost complete.

But they are worth it, every one of them. An outfit with a correctly proportioned variable-condenser rightly placed is a thing of joy to manipulate. What with C. W., and its hair-line tuning ruling the waves, one or more variables are absolutely essential.

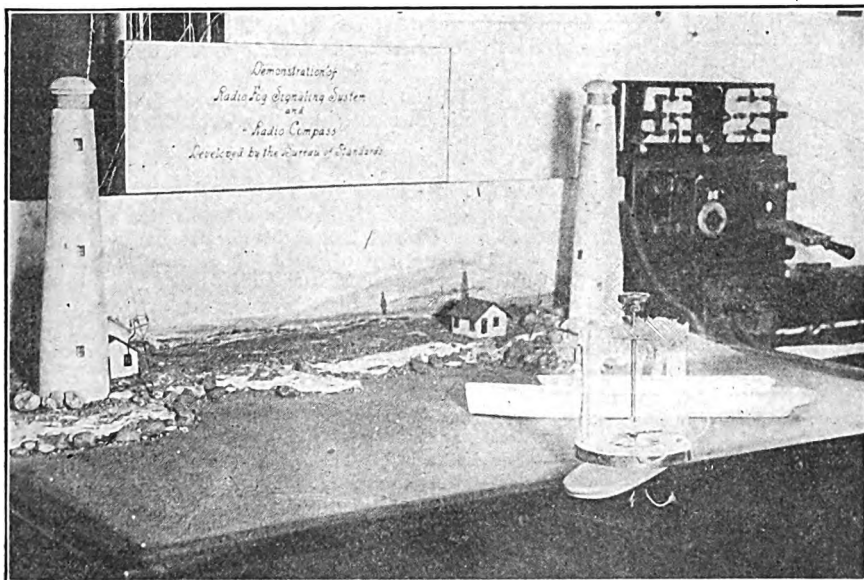
* * *

Code—the By-Product of Your Interest in Radio.

WHEN the fine edge of your interest in broadcast music, speeches, and canned songs commences to wear off, don't come to a hasty conclusion that "there's not much in this radio stuff." Give a thought to code.

There is something fascinating about the Code. It is an accomplishment to learn it. It is a further accomplishment to be able to take down some of these "fists" that are shoving messages on the night air with a motion as smooth as a baby's face. Perhaps you won't be interested in the message. That isn't the point. But the message represents an actual two-way conversation between two enthusiastic amateurs, miles apart. Their sparks—or waves—are attractive.

Radio Models at Bureau of Standards



(c. Underwood & Underwood)

Everyone interested in radio has heard of the Bureau of Standards at Washington, D. C. This department experiments with and designs the finest radio equipment, as the Navy and Army must have the latest and most modern devices. The accompanying photograph shows two models of a radio fog-signaling system and radio compass. Note the two lighthouses equipped with transmitters with the radio station at the base of each tower. These radio-compass stations send out signals during heavy fog in order that incoming vessels may pick up these signals and get their true bearings.

Radiograms

PRESIDENT HARDING'S MEMORIAL DAY ADDRESS, delivered at the dedication of the Lincoln Memorial, Washington, D. C., May 30, was heard by more persons than any address ever made by a President of the United States. It was broadcast by wire from the massive memorial erected in honor of The Great Emancipator, to the government station at Arlington, and then given to the Hertzian waves on a length of 2,650 meters.

RADIO LOCATED TWO YOUNG BUFFALO RUNAWAYS several weeks ago, it is learned. The lads, aged fourteen years, left their homes ostensibly to go to school. When they failed to return at night, their mothers telephoned the Federal Telephone and Telegraph Company, and a complete description of the boys was broadcast from WGR, the radio station of that company. The message was picked up at a station west of Erie. The next day, the man who caught the message, while motoring, saw two boys who answered the descriptions of the runaways. They admitted they were the missing boys—and were returned to their anxious parents.

THE GOVERNMENT'S EDICT AGAINST POLITICAL BROADCASTING HAS MET WITH OPPOSITION. The American Radio Association, through F. W. Brown, its executive officer, protests the discontinuance of the politician's privilege to send his views over the ether waves. Secretary Hoover will be asked to permit the use of government stations by political candidates, notwithstanding the orders of Theodore Roosevelt, jr., acting secretary of the Navy.

WITH A RADIO SET IN OPERATION, A PASSENGER TRAIN RAN THE HUNDRED MILES FROM OKLAHOMA CITY TO LAWTON, OKLA. The train was a passenger express of the Frisco Lines. The run established a record as the longest continuous communication, without interruption, ever held by a fast-moving train.

AN APPROPRIATION OF \$68,000 HAS BEEN ASKED BY THE CITY OF CHICAGO to purchase a further supply of radio apparatus for its police department. Chicago claims to be the first city to apply radio to police purposes, and it has found this crime-detecting utility a great success.

THE PACIFIC COAST STATES CLAIM 25,000 OWNERS OF RECEIVING SETS. Some estimate the number at 50,000. What the country will soon need is a radio census taker. "Some of our lads," says a Far Western enthusiast, "are picking up messages from Japan." This should make any easterner tune up.

AMERICA IS SPENDING ABOUT \$6,000,000 a week for radio instruments. Conservative estimates also show that the radio manufacturers have a total of over \$60,000,000 worth of

orders booked ahead. Next year this country will be spending \$10,000,000 a week for radio sets, but the manufacturers will be abreast of the demand with their deliveries.

WARNINGS SENT TO MOONSHINERS BY RADIO have foiled a number of raids on illicit stills in the mountain districts of the South, prohibition officials declare.

A GREETING BY WIRELESS TO PRINCESS JULIANA, OF HOLLAND, FROM 5,000 PATERSON, N. J., SCHOOL CHILDREN, of Dutch parentage, was sent recently by Mayor Van Noort of that city.

RADIO ENHANCED A BUSINESS MEETING when the Yorkville Chamber of Commerce, New York City, featured the news and music that comes through the air at its quarterly session.

CHICAGO TAXI-CABS ARE TO BE SIGNALLED BY RADIO. Patrons hope, thereby, to get better and quicker service. The scheme is to use the radiophone at the central office of a large company where calls are heaviest. The company has installed a transmitter in its garage, and receivers on the stands and cabs, to notify drivers where they shall report for their fares.

A SAFETY-FIRST MESSAGE TO LOOK OUT FOR RAILROAD CROSSINGS was broadcast last week. It was sponsored by the American Railway Association in connection with the national "careful crossing campaign which will be kept up until September 1.

LOUIS FALTONI, OF ROSWELL, N. M., has been awarded the silver loving cup donated by Herbert R. Hoover, secretary of commerce, to the wireless operator who constructed and operated the most efficient amateur station in the United States, in 1921. Mr. Faltoni's station, in New Mexico, has been heard in every State except Maine and the Territory of Hawaii.

HIGH-POWER WIRELESS STATIONS AT BOGOTA BAY, COLOMBIA, AND CUBA will be completed, this year, by the Radio Corporation of America. The great Buenos Aires station will be in operation in the summer of 1923.

FRANCE HAS THE MOST POWERFUL RADIO STATION IN THE WORLD in the American-built Lafayette towers near Bordeaux; but this will be superseded, at the end of this year, by the Port Jefferson station, Long Island, N. Y., of the Radio Corporation of America, which then will be the most powerful station in the world. The station under construction at Saint Assise, near Paris, will be second.

THE BRITISH WIRELESS CHAIN CONNECTING ENGLAND WITH THE EMPIRE will have one station comparatively close to Argentine—the station at Bathurst, Cambia, on the extreme western point of Africa, where the continents of Africa and South America make their closest approach.

HOLLAND IS BUILDING one station at home and one in Java in order to communicate a distance of 6,100 miles, almost entirely overland.

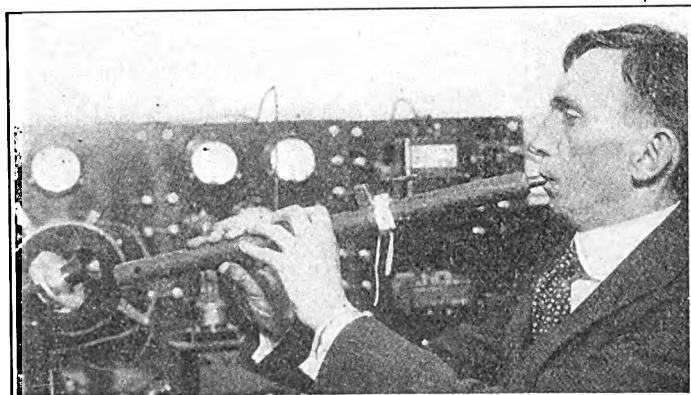
"WILL RADIO REPLACE THE CABLE IN TRANS-OCEANIC COMMUNICATION?" was a question put to L. W. Austin, head of the United States Radio Research Laboratory. "Frankly do not believe it will," said Mr. Austin. "If it should, it will be because atmospheric disturbances have been practically eliminated. But, even now, there are certain classes of traffic which can be sent by radio much more economically, and quite as satisfactorily where delays of a few hours are not objectionable."

A CHIME OF SIXTEEN BELLS WAS HEARD 800 MILES AWAY. The chiming took place in Watervleit, N. Y., and was picked up in Athens, Ga. The bells were mounted on pine supports and their music was carried by wire to the General Electric Company's broadcasting station at Schenectady, N. Y. (WGY), at which place it was put on the air. Despite the fact that the bells were "played" inside a foundry, their music was heard clearly in many places. The largest of the bells, the "tenor" weighs 4,800 pounds; the smallest, 225 pounds.

PLAINFIELD, N. J., IS THE FIRST MUNICIPALITY in that State to get permission to operate a limited broadcasting station for police and other civic purposes.

PLANS FOR DIRECT RADIO BETWEEN AUSTRALIA AND GREAT BRITAIN have been announced. They provide for a giant station that will transmit 12,000 miles.

Indians Hear Songs by Radio



(c. Wide World Photos)

Charles Wakefield Cadman, the eminent composer, playing an Indian love song on a native flageolet (the Indian saxophone), a finely tempered wood-instrument, at a broadcasting station in Los Angeles, California. The music was heard in a number of Indian reservations where receiving sets had been installed.

Radio and the Woman *By Crystal D. Tector*

WOMEN dislike newspapers and other publications to publish only alleged funny stories in order to represent the feminine interest in radio. Most of the women interested in the new marvel, who have talked with me, claim that they are mighty serious. They object to being made the butt for jokesmiths.

Most any big department store will tell you, if you ask at the radio sales-department, that at least half the inquiries for sets and parts are made by women, and that their knowledge of the science is equal to that of the men.

The Hawaiian songs broadcast on Saturday by WWZ, (Wanamaker's) came over the ether clear and distinct. Miss Edith MacDowell, a soprano, played the ukelele; Miss Grace MacDowell, contralto, added to the accompaniment on a guitar.

I stood in a radio shop on Amsterdam Avenue, New York, one evening, last week, and heard a wonderful violin solo, by Fritz Kreisler, come through. I noticed four enraptured young women near me. It certainly was a fine bit of broadcasting. "I could almost imagine that Kreisler, himself, was playing in the room here," said one of the young women.

Miss Maude Fealy, the actress, recited the Shakespearean philosophization, "The Quality of Mercy," into the transmitter at WJZ, Newark, last Monday. On Saturday, Miss Susanna Crocroft sent over the waves, from the same station, "Woman's Place in the Health of the Nation."

A woman subscriber writes—and I am always pleased to receive letters pertaining to radio from RADIO WORLD's feminine readers: "For keeping the men folks at home, radio beats anything I know of. I have asked my husband and my sons, repeatedly, if they imagine they will ever tire of it. Their answer is that it produces too many surprises."

"It does not make any difference, in reference to the wave length, whether the series condenser is placed in the ground lead or in the antenna lead." Another woman reader thus answered a neighbor, also a woman, who asked her how the variable condenser should be placed in series with the primary inductance, in order to receive short wave-length stations on a long antenna. She wants RADIO WORLD to tell her if her answer is correct. It is.

Every week-day afternoon, in a smart tea room on Fifth Avenue, the radiophone sends forth its program while the fair patrons sip tea and chatter. Recently, in the buffet car of a passenger train, a dozen women passengers and one man surrounded the radio receiving-set.

Mrs. J. George Fredericks, noted radio expert, recently broadcast a most interesting talk on wireless.

Miss Jessie E. Koewing, only woman announcer of broadcasting programs, and stationed at L. Bamberger & Company's store (WOR), Newark, N. J., says that it was through her ability to play the violin that she secured her present position. Called on to broadcast her music, Miss Koewing became so absorbed in the marvelous possibilities for positions for women in radio, that she determined to enter this great field in a more useful capacity than that of performing for her unseen audience. Evidently officials

of Newark's big department store strengthened this decision, when, on ascertaining that her voice was the sort that broadcast splendidly, they suggested she work for them. Miss Koewing intends to devote all her future efforts to radio. At present she is working hard on code. She asks why, when her work brings her into touch with great artists whom she has wanted to know, and who she might not meet otherwise—should she be interested in anything else?

A friend who has just returned from Europe, says that travelers display more genuine interest in the carefully restricted radio rooms on ocean liners, than in any other part of the ship.

Will women figure in the radio trade? Perhaps not. At any rate, it is interesting to note that a society woman in Boston has become interested in a new radio manufacturing concern. She insists that it is no more difficult for her to attend to business than it is to take care of her social responsibilities, and she enters the radio field feeling that there is a great chance for her to show the world at large that no science or business is too complex for the feminine ambition.

There is one thing that radio is doing for the attractive young women of the stage—it is opening up another avenue of escape for photographic and other publicity. And, oh! how the young things are taking advantage of this great opportunity.

A Mayor on His Vacation



(c. Keystone View Co.)

Mayor Cryer, of Los Angeles, California, aboard the steamer "Yale," on a vacation trip, kept in touch with his office by the ship's radio. The photograph shows the Mayor and Mrs. Cryer.

Coming Events

The editors of RADIO WORLD will gladly publish news items of all contemplated radio shows and expositions. Keep us posted, by mailing full information.

MILO E. WESTBROOKE RADIO SHOW.—Leiter Building, Chicago, June 25 to July 1.
FIRST CENTRAL WEST RADIO SHOW.—Auditorium, Milwaukee, Wis. Week of June 21.
SPRINGFIELD RADIO EXPOSITION, Springfield, Mass. Under auspices of Springfield, Mass., "Daily Union." June 19, 20, 21, J. P. O'Connor, managing director.

CHICAGO RADIO SHOW, Coliseum, Chicago, Ill., October 14 to 22. U. J. Hermann, managing director, 549 McCormick Building.

KANSAS RADIO EXPOSITION will be held at the Kansas State Fair, Hutchinson, Kansas, September 16 to 22 inc. A. L. Sponsler, Secretary.

FIRST INTERNATIONAL RADIO EXPOSITION, Grand Central Palace, New York City, George Brokaw Compton, Secretary. Date not set.

An Explanation

THERE appeared in RADIO WORLD, dated May 13, 1922, an illustrated article entitled "My Practical V-T Detector and Two-Stage Amplifier," appearing under the signature of Frederick J. Rumford. The editor of "Radio News" informs the editor of RADIO WORLD that a similar illustrated article appeared in his publication under date of September, 1921. Inquiry made by RADIO WORLD of Mr. Rumford discloses the fact that Mr. Rumford's secretary mailed RADIO WORLD the wrong article, which was published by us in good faith. We thank Mr. H. Gernsback for calling our attention to this error, which we regret having made.—Editor, RADIO WORLD.

THE Bureau of Standards has issued a statement to radio receivers, generally, explaining how static, strays, or atmospheric, may be reduced. Don't be surprised if your new receiving set gives forth a first-class imitation of a boiler shop in full operation instead of an anticipated lecture on the culture of silk worms. A great deal of work has been done by radio

engineers and scientists in efforts to reduce the interfering noises caused by these strays. At important government and commercial stations certain devices and methods are in use by means of which strays are considerably reduced and it is possible to obtain fairly reliable reception during the intense heat of the summer season.

Latest Wonders of Radio as Applied



(Left) The what a you plish when his own of Leppert, j cian and building 4 years ago seriously Batteries, 1 speaker a and stand enthusiasts pert reside where he p

(c. K)



(Left) For some time, O. D. Orvis, radio operator at Bamberger's Department Store, Newark, N. J., had trouble with his receiving set—and, what worried him most, it always came during the luncheon hour. The photographer discovered, and indelibly recorded, the cause of the trouble. Miss Josephine Garvin, ably supported by Miss Ruth Mott and Miss Bertha Bitzer, located the lead-in switch—and no wonder Mr. Orvis couldn't listen in!

(c. Kadel & Herbert, News Service)

(Right) The out-o'-doors enthusiast is a busy "bug" these sunny days. No vacation will be complete without radio. Walter and J. V. Candide, of Flatbush, N. Y., are experimenting with a receiving set, the aeriels of which they are attaching to trees. They are planning a camping trip this summer, and will make several important experiments before starting. Both are known as inventors of valuable radio parts.

(c. P. & A. Photos)



(Right) Joseph D. R. Freed, the twenty-two-year-old president of the Freed - Eisemann Radio Corporation, N. Y., whose business associates call the "Henry Ford of radio," because of his inventiveness.

(c. Underwood & Underwood, N. Y.)



(Left) Radio World has never let slip by an opportunity to tell how strong a link binds radio to motoring. The photograph shows the Misses C. Therine Stevens and Mary Williams of Boston, enlivening their idle moments in a car fitted with radio.

(c. International News Reel)

(Right) The high-tens the police boat, "John one of the powerfully operated in New York New York City. This of the most up-to-date the world. Radio was a means of entertainment means of service, seven and the result has been flying.

(c. Kadel & Herbert)

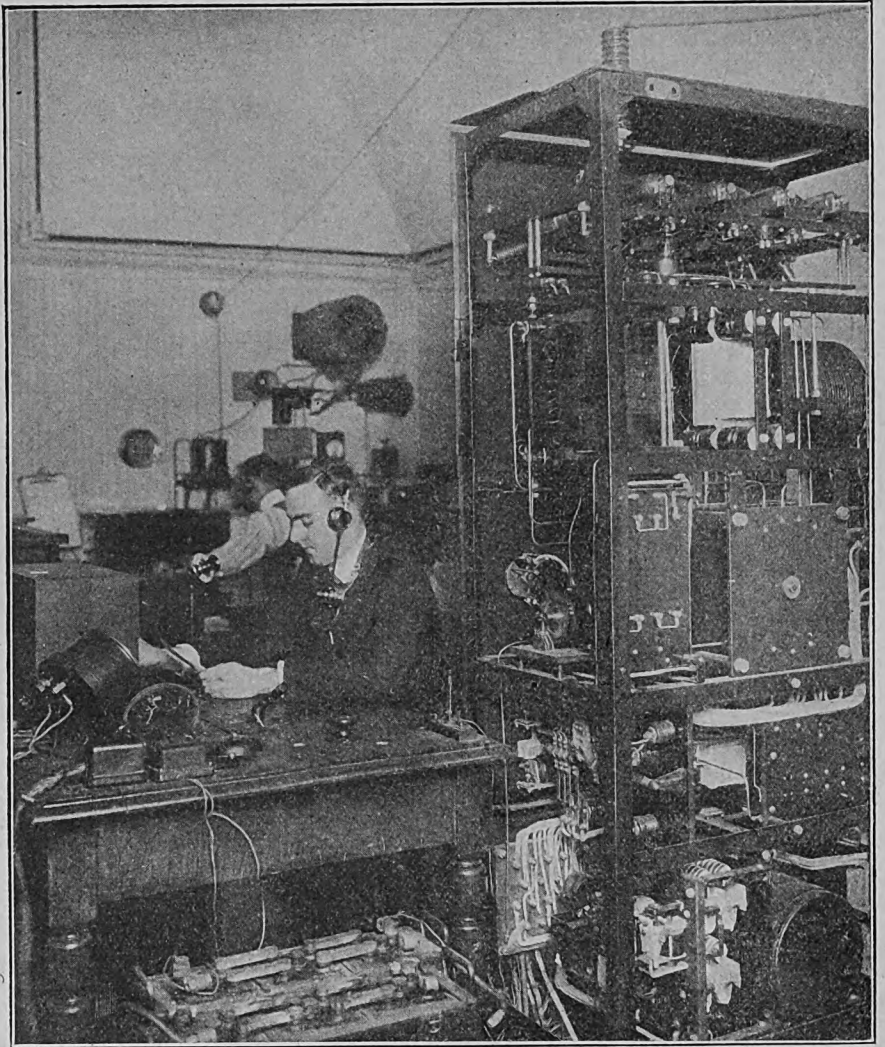
ed to Pleasure and Pragmatic Uses

... photograph shows
... man may accom-
... he decides to build
... radio set. But R. E.
... is a natural electri-
... inventor. He began
... receiving sets three
... when radio was taken
... by very few people.
... receiving set, loud-
... all, it as thorough
... and an outfit as any
... could wish. Mr. Lep-
... in Harrison, N. Y.,
... regarded as a wire-
... is authority.

(c. Galloway, N. Y.)

(Right) This is a photograph of the radio room of the United States Post Office Department, at Washington, D. C. from which market and weather reports, and, also, information of value to miner, rancher, orchardist, and lumberman is disseminated by far-reaching ether waves. This outfit, like all others used by the government, is of the most perfect make—for Uncle Sam finds radio his most useful messenger. For instance: every night, at 11:01, the weather report is broadcast. The time tick goes at 10 p. m.

(c. Harris & Ewing, Washington, D. C.)



(Above) Albert T. Darling, manager of B. F. Keith's Royal Theatre, The Bronx, New York City, in his radio-equipped office. Mr. Darling is "long," as they say in Wall Street, on business improvements. He realized that radio would help him and he had a set installed. Orders for seats are received and with a correctness and dispatch that, it is expected, will make radio a necessity in every well-managed theatre, in the future.



(Below) You may imagine that Mr. J. G. Daly, in the photograph, is telling the conductor of the Fifth Avenue bus, New York, on the upper deck of which he is taking an outing with Miss Katherine Mulcahy, to "keep the change;" but this is not so. He simply does not want to be interrupted until the broadcasting they are hearing through their radio set, connecting with the bus, is over.

(c. Kacel & Herbert News Service)



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(service)

Broadcast Bill's Radiolays

(Copyright, 1922, Westinghouse Electric & Manufacturing Co.)

The other day Abe yelled at me, "Go get yer hook an' line; let's go down on the Kickapoo, the fish are bitin' fine." I sez, "All right, I'll be there just as soon as I can get my fishin' tackle ready and my good receivin' set." Then Abe said, "What the dickens be ye goin' to do with that?" I sez, "Don't get excited er start talkin' through yer hat, yer goin' ter see some fishin' 'a la mode' right up ter date; cause things bin movin' mighty fast on this here farm of late." Abe ast me heaps of questions, but sez I, "You wait an' see the newest type of fishin' underneath some shady tree." I strung a wire between two trees while Abe was diggin' bait, connected up an' tuned her in—I didn't hafta wait; fer soon's I got those earmuffs on, I heard a band a playin' an' then a feller sang a song like our ole mule a brayin'. Abe said he wasn't int'rested an' started up the crick; I said I guessed I'd stay here where the grass was nice an' thick. So, I stretched out there in the shade prepared to fish or lissen, an' anglin' after fish er news there wa'n't no chance a missin' either one; first come, first served—I couldn't ask fer more, a little speckled



"The newest type of fishin'"

shiner or the latest baseball score. The first thing on my program was a song sung by some gal; then I pulled in a croppie to

the tune of "You're My Pal." It wuzn't long till Abe come back an' set down s'ide o' me, "Say, let me have them phones a while, you go an' fish," sez he. Now Abe's a friend a mine, an' so I had to let him take the earmuffs for a while an' lissen, just fer friendship's sake, I let him lissen quite a bit—it musta bin two pieces—an' then I sez, "Give me them phones er else our friendship ceases." Well, after arguin' a spell we said we'd arbitrate, for durin' th' discussion, Abe had upset the bait; an' so we took a phone apiece; we didn't fish no more, an' Abe an' me is friends again, same as we wuz before."

When on Your Vacation

If you contemplate going away for the summer months, don't forget the various things that have to be done before locking up the house. If an outdoor aerial is erected, make sure of proper grounding, see that the grounding switch, has not corroded at the terminals, possibly preventing proper electrical connections. This is of importance to all who are closing their homes for the summer.

If it is too much of a job, the proper thing to do would be to take down the aerial, roll up nicely, avoiding kinks and breaks, and stow away.

Answers to Readers

ARE the ordinary dry cells connected in series of say, four, eight or twelve, as effective in a regenerative receiver as a storage battery? I have read a few articles regarding dry cells but have not been able to get any satisfactory information.—C. E. S.

Connecting dry cells in series will not increase the life of a dry cell, but simply add to the voltage. However, for expert information concerning filament lighting, purchase a good radio storage-battery of some well-known make. It will repay you for dry cells, fourfold. Read the article on storage batteries, by George W. May, in your copy of RADIO WORLD No. 6, dated May 6.

* * *

Could you give me the best type of aerial I could use, by examining the enclosed illustration?—Charles H. Yaeger, Rocky Hill, Conn.

According to your illustration, use your antenna as a "T" aerial running it east and west.

* * *

How many steps of amplification do I need to receive WJZ? I am 250 miles away and wish to use a loud speaker. Can I receive Arlington on the hook-up herewith?—John B. Hough, Warrenton, Virginia.

Your first question is hard to answer. However, if a good reliable regenerative set is purchased, including a two-step amplifier, some good results may be obtained for the distance you mention, with a loud speaker. Probably a good amplifying loud-speaker, such as the Western Electric makes, with three more steps would give you service. Bear in mind, you will then have five steps and a detector. Regarding your second query, it is impossible to hear NAA, (Arlington) with that set. You will have to get a winding on the coupler that will enable you to get up to his wave of 2,500 meters.

Owing to the large numbers of questions received from readers it is impossible to answer all in this number. Your replies will appear in the next or future numbers of Radio World.

Is the Keystone Lightning Protector approved by the fire underwriters? Is an arrester as good as a lightning switch? Would a phonotron be all right to use as an amplifier, such as the King Amplitone, with a detector and one-step amplifier, using a Murdock phone?—Frank H. Dargue, Kittanning Pa.

Your first question will have to be taken up with the National Board of Fire Underwriters, 76 William St., New York, N. Y. Arresters sometimes fail; but once the aerial is grounded the lightning is killed.

The phonotron is a device regarding which we can give you no information further than that published in RADIO WORLD. Lieutenant Paddock, U. S. A., Fort Wood Radio Station, N. Y., is the only person we know who could enlighten you. Fort Wood, we believe, is the only station equipped with phonotrons. This instrument is controlled entirely by the United States Navy Department.

I have a crystal set consisting of a single-slide tuner, De Forest type, with a pair of 2,000-ohm phones, 3 wire, 30 feet long, 35 feet high. My aerial runs straight with telephone wires, being about two inches away. Will this interfere with my set. I have heard a human voice but once, but not loud enough to be understood. What can I do to hear distinctly and eliminate interference?—"Wireless Bug."

Answering your first query; try and see if you can run your aerial in one stretch, about 100 feet. One wire aerial is far better than any number at a shorter distance. When erecting your aerial, run it

in such a manner that it will be at right angles to the telephone feed; and, if possible, keep it clear from it as much as possible. The further you get away from the telephone wire, the better it will be for strength of signals. Don't place your ground wire on the same ground near by the telephone company. Seek a new ground. With all this in view, signals should respond, provided you have a good sensitive crystal.

Can I use a loud-speaker horn, with one vacuum tube on an inside aerial? The tube used is a UV 200?—Jack Polkinhorn, Washington, D C

This is NOT possible with an indoor aerial; but with the aid of a two-stage amplifier and a good power-amplifying loud-speaker, signals using loops are sure to be heard

* * *

How far can I receive with a De Forest receiver type D. L., 800 with two-stage amplifier? What length should my antenna be and in what direction should it run, to get best results?

Will another stage of amplification enable me to receive further?

Which should I use, 2,000-ohm or 3,000-ohm receivers?

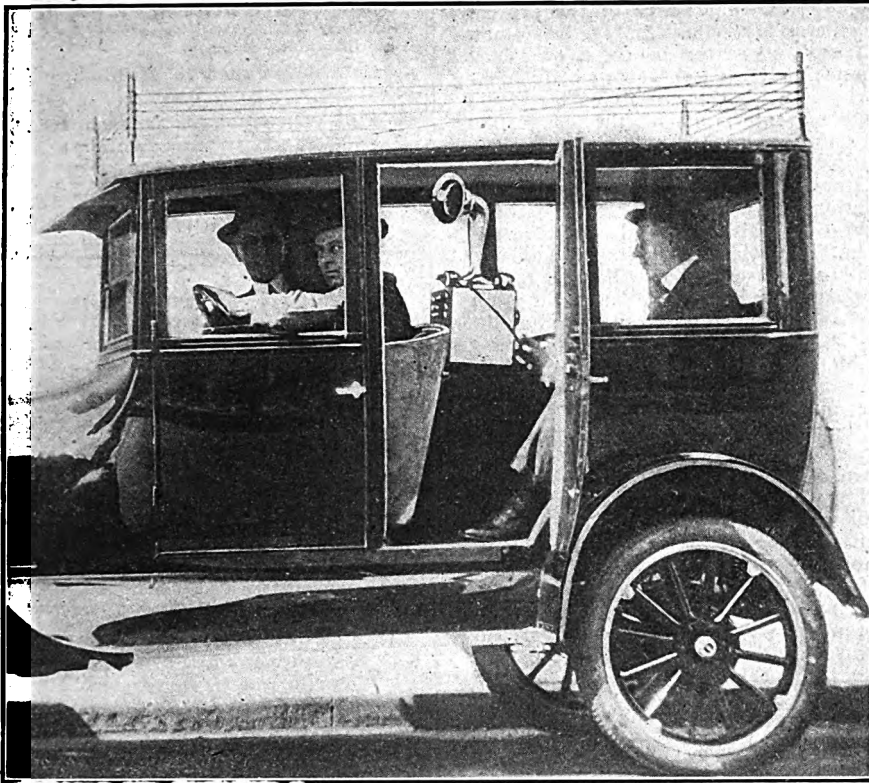
* * *

Would using two or more sets of receivers have any bad effects on my machine?—J. N. Lignon, St. Louis.

Your first question is too broad to answer; but with a good antenna erected, very good results should be obtained. Your antenna for receiving purposes only, should be one straight wire about 100 to 150 feet long. The direction will be where the lead-in was taken off.

One more step of amplification will increase amplification; but it is difficult to say if it will increase the range. You can use the 2,000-ohm or the 3,000-ohm. Remember only one set can be actually in operation at one time.

Radio Now Joined to Motoring



(Photograph from World Wide Photos)

One of the latest developments in the radio industry is the radio motor-car. Experiments have proved that radio equipment operates satisfactorily in most cars made to-day. One well-known manufacturer of automobiles is applying this method by installing radio equipment in his car. An aerial is erected on the roof, or hood, of the car in such a manner that the appearance does not look junky, yet, after the aerial is up, the set is placed in the car, the ground connection being made to the metal frame. Then everything is ready for reception. Following this method, anyone may install a radio set in his car, and, while journeying along the road, may keep in touch with the nearest broadcasting stations. With a car equipped in this fashion, it is possible to journey within a radius of twenty-five miles of a station and pick up messages.

THERE are several ways that the motorist can equip his car to receive the various interesting programs which are being broadcast daily, is the belief of H. Clifford Brokaw, technical director of the West Side Y. M. C. A., Automobile Schools, in an article in the New York "Tribune." He can suspend an antenna aerial above the top of his car from a projection in the rear to one in the front. This can be connected with a receiving set in the back seat of the car. From this receiving set he can hook his ground wire directly to the frame of the car. In this way he can receive messages while the car is in motion.

Or, he can use what is known as a loop or coil antenna. This consists of a boxlike frame on which is wound turns of wire. It should be made so that it can rotate around an axis. The wires should lie in the same vertical plane. This antenna can be placed in the end of the car over the back of the rear seat. The antenna on an automobile is somewhat like the fifth wheel on a coach. The fifth wheel on a wagon is a semi-circular piece which has another piece resting on it that acts as a bearing to facilitate the turning of the front axle when steering the vehicle. It is a so-called wheel placed in a horizontal position which keeps the body from turning exactly with the front wheels. The fifth wheel of an auto might be called the loop-antenna, which is placed in the rear of a car to facilitate the receiving of broadcast programs for the enjoyment of the passengers out on a motor tour.

The most practical use of the radio in connection with motoring, however, is not while the car is in motion. This is especially true of some cars which are noted for their rattling capacity. The electrical equipment of a car in action might also interfere with the clearness with which messages could be received.

The ideal use of the radio as an asset to the motorist comes when he arrives at a point of destination for his week-end trip.

So he gets out his radio outfit. For an antenna he takes a wire about 100 feet long, attaches a string to one end of it and to the end of the string a stone. He throws the string over a branch of a tree about thirty feet high, so that the string, and not the wire, has the contact with the tree and the stone acts as a weight to keep the string from slipping off the branch. Then he stretches this wire for about seventy-five feet in the air, attaches it to his receiving set, takes another 100-foot wire which he strings along the field and attaches this as a ground wire to his receiving set.

Now the motorist is ready to listen in.

For a receiving apparatus the motorist can use a crystal set which doesn't require any current to operate. Such a set will ordinarily pick up messages a score of miles away. If, however, he desires to work on a larger radius, he will want to use a vacuum-tube set. This will require a special bank of dry cells and a storage battery. For a storage battery he can tap onto the one that is apt to be in his automobile.

MAGNAVOX Radio



WIRELESS TELEPHONY

Yesterday a scientific marvel, to-day the most thrilling interest and enjoyment within reach of the average American home.

In the air, day and night, superb concert and dance music, important addresses, hilarious vaudeville, world weather reports; also correct time signals being broadcasted by radio-transmitting stations in every part of the country.

Here is a new world of information, education and inspiration; an "Aladdin's" dream realized in actual fact when you install in your home any one of the many simple receiving sets with a Magnavox Radio.

The Magnavox Radio makes it possible for you to hear all that is in the air as if it were being played by your phonograph.

Any Radio dealer will demonstrate for you, or write to us for descriptive booklet and name of nearest dealer.

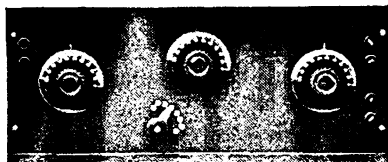
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"EVERYTHING IN INSULATION"
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The HI-GEE RADIO CONCERT RECEIVER Price, \$29.50



The above instrument comes to you completely assembled, ready to wire; all parts mounted on genuine Formica Panel, set in quartered oak cabinet with hinged cover. Panel is properly shielded so that no "body effects" are experienced with this instrument. This is truly a HI-GEE quality instrument consisting of two variometers, one variocoupler, socket and rheostat. (Rheostat not shown in above cut).

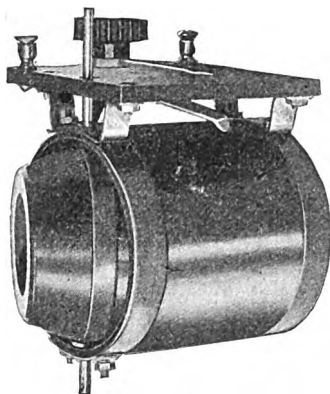
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Radio Products of Dependability Are Always Good Sellers—Try Them



(Patent Pending)

Our "EVERY-WIRE-CONTACT" Coupler as illustrated is made strictly along scientific lines—the primary coil has a lever contact affording an every-wire-adjustment of this element which eliminates the disadvantages of the old style primary or tuning coil with soldered taps and its poor selectability—at the same time the rotor is accurately fixed with perfect air gap allowing further finer tuning—the unit is ideal for use in regenerative or crystal sets.

We Are Prepared To Ship In Quantity.

MORELAND SALES CORP.
30 OGDEN ST.
Newark, New Jersey

There Should Be 300,000,000 Wave Lengths

THEORETICALLY there should be 300,000,000 different wave lengths available; but, in practice at the present time, there are considerably less than 20,000, says a writer in the New York "Tribune," but even these are badly congested, and with the advent of broadcast radiophone entertainment the congestion is becoming worse daily.

The problem is not merely one for the legislators. Their efforts can only end in regulation, which of course will only ameliorate the situation and not solve the problem. The solution lies in the hands of the radio engineers, who will have to devise apparatus which will eliminate a great deal of the present interference, and at the same time give us a greater number of available wave lengths to operate on by making them more sharp both in the transmitting and receiving stations.

In theory it is possible to operate, for instance, on every individual wave length between 360 meters and 370 meters, but in actual practice this is just a wave band, and all stations operating on wave lengths within those two limits will interfere with one another.

The advent of continuous wave telegraphy and telephony has done a great deal toward making tuning sharper, so that wave lengths fairly close together can operate without interfering.

To Obtain Good Tubes

AMATEURS who are constructing their own experimental tubes find chief difficulty in obtaining a good vacuum, says the "Evening Telegram," New York. The following is a simple but effective method of doing it:—

Have a small glass tube projecting beyond the end through which to draw the air.

Get rubber bulb, or ball, large enough to hold all the air contained in the valve and more and which should fit on the glass tube.

Squeeze all the air out of the bulb or ball, and holding it, so squeezed, fit it on the glass tube.

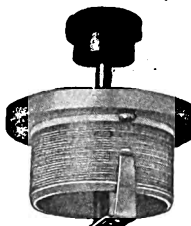
Now let go and, the bulb on, seal up the glass tube by holding it over a bunsen burner.

Many tubes that seem to be gone entirely can be revived by this method.

To Adjust Crystal Detector

In order to keep a crystal detector in perfect adjustment, first find the most sensitive spot by a buzzer test. When the point of the "cat's whisker" is well placed, drop some hot beeswax or paraffine around it. In practice, this has kept the whisker in the right place for months, and eliminates the necessity of seeking the elusive sensitive spot every time the set is to be used.

The Ajax All Vernier Rheostat (Patent pending)



10,000 Adjustments

The ideal rheostat for fine control of Amplifier and Detector Tubes. Aluminum Base. Asbestos Insulation.

2amp. .7ohm. 2 1/4 in. base, \$1.75 postpaid.

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Buy from your dealer or send to
PHILLIPS MCH. CO., 28 Newberne St.,
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Radio Set Complete

Enjoy daily concerts, weather crop and sporting news.

Complete Outfit
Including 2,000-ohm Phones, Immediate Shipment **\$12.75**

Can be installed in 30 minutes by any one.

Full instructions with each set. Send check or money order to.

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Radio Apparatus

Immediate Shipment from Stock

Frost Head Phones, 3,000-ohm ... \$6.00

Frost Head Phones, 2,000-ohm ... 5.00

Dictograph Head Phones, 3,000-ohm ... 12.00

Estru Lattice Type Variometers ... 5.00

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These are small compact instruments of the lattice type with no unnecessary frame work. Maximum efficiency, sharp tuning.

Ideal for portable sets and for those who build their own because of easy accessibility.

3" Bakelite Dials with knobs75

43-Plate Variable Condensers ... 4.00

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These condensers are of the very highest quality. Fully guaranteed.

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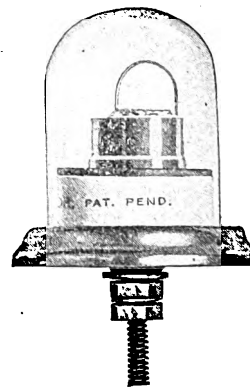
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In using the GREWOL you don't have to find the spot.

THIS DETECTOR IS ALWAYS SET AND READY

GUARANTEED ONE YEAR IF YOUR DEALER DOES NOT HANDLE THE GREWOL SEND US \$2.00 AND WE WILL MAIL ONE TO YOU.

DEALERS WRITE FOR PROPOSITION

RANDEL WIRELESS CO.

9 Central Ave., Newark, N. J.

Radio Patents

RECENTLY ISSUED

FRANK GARACA, of Cleveland, has invented an improvement for batteries that are used in generating electricity, and that will make it unnecessary to use chemicals. He claims that a battery, supplied with his improvement, when extraneously heated will generate electricity.

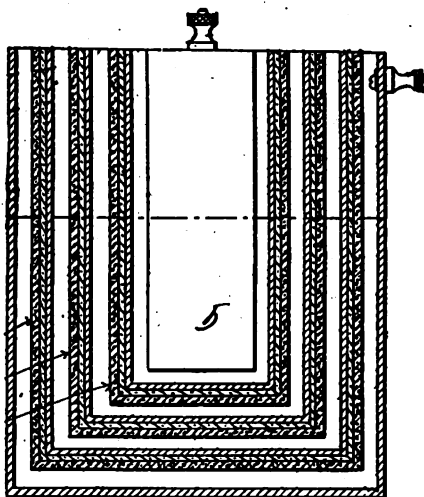


Figure 1.

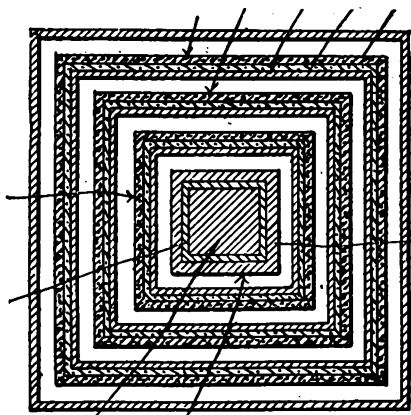


Figure 2.

Figure 1 represents a vertical section through a battery constructed in accordance with this invention, and

Figure 2 is a transverse section taken on the line 2-2 of Figure 1.

HARRY T. HIPWELL, of Pittsburgh, has secured patent papers on a container for dry battery-cells which is intended to provide a simple but efficient means whereby any desired number of cells may be connected up, at any time, to secure the required voltage, without opening the container wherein the cells are located. As an article of manufacture, it is a battery-package including a boxlike receptacle comprising a body; battery cells in the body and provided with terminals; and a cover whereinto the body is telescoped, the side walls of the cover overlapping the side

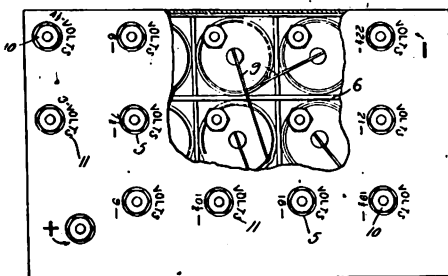


Figure 1.

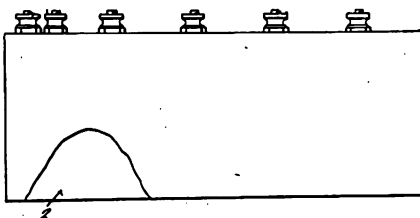


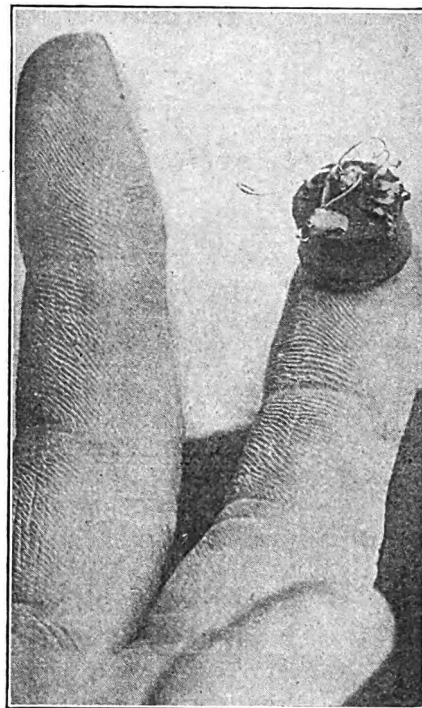
Figure 2.

Figure 1 shows in top plan, a device constructed in accordance with the invention. Figure 2 is a side elevation.

walls of the body to reinforce the receptacle in the retention of the cells, the cover comprising a top disposed above the upper edge of the body and provided with openings through which the terminals extend, the top having markings located closely adjacent to the openings and indicating the voltage available at each opening, the terminals projecting above all portions of the receptacle, to render them accessible, the body acting as a guide for the cover, whereby the terminals of the cells will be directed into the openings, when relative telescopic movement between the body and the cover takes place.

One of the Smallest Radio Receiving Sets

NO doubt, every radio owner knows that, at times, signals come in stronger than at other times. This is due to either weather conditions or the erection and construction of transmitting and receiving stations. However all sorts of experiments are undertaken. Probably a new aerial is devised and, if not, possibly the set may be taken apart and reassembled. This experimenting gives some practical knowledge to him who undertakes the job. Experiments are being made by thousands of



(c. Keystone View Co.)

One of the smallest type of receiving sets ever made. Note the position of the detector and coil which, evidently, should be the tuner. It can be held on the tip of one's finger.

radio enthusiasts, and if one compares the various equipment of the moment with that of a few years ago, he cannot help but notice the improvement and design of apparatus.

The accompanying photograph pictures a unique experiment, the work of Allen Turner, a newspaper artist of Los Angeles. It is one of the smallest receiving sets made. It is called the "Radio Cricket," and can be used by anyone if an aerial and ground are connected to it.

It measures less than a half inch in height, and has 650 turns of wire in the coil. The crystal detector is mounted on top. There is no question that some would call it freakish, but Mr. Turner claims that it is a practical receiver for anyone. That it is much smaller than the photograph represents is evident by comparing the photographed fingers with your own. They are several times as large.

With sending stations interfering with one another, the radio is almost certain to encourage great forward strides in the art of cussing.—The "Evening Telegram," New York.

Old Commercial Apparatus

MANY, many years ago, when wireless was in its infancy, says "Radio Review" of "The Evening Mail," New York, Marconi invented what became known as the magnetic detector. This was used to replace the unreliable coherer. The magnetic detector was little more than a makeshift when compared to the crystal detector which was introduced a few years after Marconi made his contribution to the art. The crystal detector was much more sensitive than the magnetic detector. Then the modern three-element vacuum tube invented by DeForest made its appearance.

The vacuum tube is perhaps the most sensitive instrument ever produced.

The reader will think that every ship on the high seas is provided with the most modern receiving and transmitting apparatus. Some of us will be surprised to learn that a large number of trans-Atlantic ships lying in New York harbor at this very moment are equipped with magnetic detectors! That shows how progressive some of our large commercial radio companies are.

Latest song: "I'll Give You the Key to My Cellar, but Please Keep Away From My Roof!"—The New York "Globe."

Radio Merchandising

Letters that Speak for Themselves

Sold 20,000 Rheostats in 3 Days

Remarkable Sales Directly Traced to
First Advertisement in Radio World

*YOUR Advertisement in Radio World
Should Give You Equally Profitable Results*

Champlin Manufacturing Co.

Electrical Specialties

90 West Broadway, New York

Radio World Co.,
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City.
Gentlemen:

New York, N. Y., June 5, 1922.

Please run copy of advertisement for the following issue, as in June 10th, number. This is getting us satisfactory results for we can trace directly orders for twenty thousands of our rheostats due to your magazine. Needless to say we appreciate this very much, since it represents business for the first three days only, after the appearance of our ad.

Yours truly,

CHAMPLIN MFG. CO., (Signed) O. GOODRICH.

90 Per Cent Mention Radio World

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New York, N. Y.

June 6, 1922.

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1493 Broadway,
New York City.

We are glad to inform you that from all the advertising we have in the various newspapers and magazines, we find that 90 per cent. of the mail we receive mentions that our advertisement was seen in RADIO WORLD.

Wishing you continued success, we remain,

Very truly yours,

LIBERTY RADIO CO.,
(Signed) DAVID KANOPLY.

New Firms and Corporations

Notices in this department are considered as purely interesting trade news and published without compensation to us. We welcome trade news of this nature. All notices having an advertising angle are referred to our Advertising Department, and are placed under Classified Advertising at 5 cents a word, or as Display Advertising at \$5 an inch.

(The firms and corporations mentioned in these columns can be reached by communicating with the attorneys, whose addresses are given whenever possible).

The Kelley Radio Company, 127 East Pearl St., Cincinnati. Capitalization, \$15,000. Winton F. Kelley, president; Ralph P. Ruddy, vice-president; E. A. Leuchtenburg, secretary; Henry S. Voelker, treasurer; H. H. Hurn. This company is supplying the trade with variable condensers and filament rheostats, and will shortly have ready fixed receiving condensers, variocouplers, variometers, and V. T. sockets. All these items will be of its own design and manufacture, and will be sold mostly through the jobbing trade. The Kelley Company will be interested in hearing from jobbers and distributors who are regularly having salesmen call on the retailers.

Independent Electrical Co., 928 7th St., San Diego, Calif.

Simplex Radio Laboratory, 27 Highland Ave., Washington, Penna.

Paramount Radio Parts and Die Corp., 176 North St., New York, N. Y.

Northern Radio Supply Co., Manhattan, realty, \$10,000; E. A. London, I. Weissberger & Leichter, 98 Nassau St., New York.)

Franklin Radio Corp., Philadelphia, manufacture wireless telephone, \$250,000. (U. S. Corporation Co.)

Manhattan Association of Radio Scouts, 73 Madison Avenue; M. Schwartz, field scout executive.

Midwest Radio Corporation. Radio apparatus, \$500,000. J. M. Frere, J. A. Frere, M. A. Alexander, Wilmington, Del. (American Guaranty Trust Co.)

Millard Radio Corporation. Manufacture radio apparatus, \$1,250,000. Theodore L. Ernest, S. E. Freeland, Samuel Baras, New York City. (American Guaranty and Trust Co.)

Bacon Electric Co., Manhattan, \$25,000; M. and A. Abraham, R. Deibel. (Attorneys, Krakower & Peters, 805 Broadway, N. Y.)

Paramount Radio Parts and Die Corp., 174 North St., New York, N. Y.

Dr. Hutchison's New Firm

D. R. MILLER REESE HUTCHISON, until recently chief engineer to all the Thomas A. Edison interests, has organized the Hutchison Radio Company, with a capital of \$1,000,000.

The Hutchison Radio Company will market immediately a crystal detector set and long range receiving apparatus to retail all the way from \$25 to \$300. Dr. Hutchison's policy proposes early production at the rate of 500 receiving sets a day of varying sizes and prices, and the production is to be nationally advertised under the name "Hutchison."

The company has taken over the broadcasting and receiving station owned by Dr. Hutchison, associated with him are G. Stanley Meikle, formerly research engineer of the General Electric Company, and a staff executive of the United States Steel Corporation; Henry C. Knox of Brumley, Chamberlin & Company; and Edward Fallows, organizer of the American Brake Shoe & Foundry Company.

Over 17,500 Radio Companies Incorporate in 5 Months.

Over 17,500 incorporations of radio companies were filed in twenty States of the United States, according to estimates gathered from various capitals. These aggregate a capitalization of over \$90,000,000.

Radio Captains of Industry

NO. 1.—A. H. GREBE



(C. P. & A. Photos)

Mr. Grebe is the designer and manufacturer of the Grebe Regenerative Receiver, shown in the accompanying photograph. It is part of the radio equipment of his motor-car. He is a well-known radio expert and engineer, and one of the pioneers in radio manufacturing.

Lefax
LOOSE-LEAF FACTS
RADIO HANDBOOK

Knows all—tells HOW
—and never grows old!

Whether you buy a complete radio outfit or build one yourself, Lefax explains just how it works and how you can change it to get best results under varying conditions.

Lefax is technically correct in everyday language. Lefax never grows old. New events will be covered on new sheets sent free each month to every owner up to July 1st, 1923. Order through your radio or book store or send \$3.50 direct to Lefax, Inc., 157 N. South 9th Street, Philadelphia, Pa.

CUSTOM TAILOR MADE
TO FIT YOUR INDIVIDUAL CAR

\$4.40 and up
Parcels Post Paid

Made in our custom shops after your order is received. We ship ordinarily in 2 or 3 days. Perfect fit guaranteed when correct name, year and model of car is given. You can easily apply it yourself.

We furnish instructions and all necessary tools, wets and fasteners. Our Catalog No. 10 with samples is free for the asking.

LIBERTY TOP & TIRE CO., Dept. R2 Cincinnati, O.

Send Radio World the Name of Your Firm

Twin City Electric Company, 301 Main Street, Lewiston, Nez Perce Co., Iowa.
Gray, Trimble, Follick Company, Bloomington, Ill., consolidation of James Gray Company and the Trimble-Follick Electric Company.

H. E. Hefner, Lexington, McLean Co., Illinois.

Wilbur J. Young, Covington, Fountain Co., Ind.

C. L. Smith Electric Co., 122 Virginia St., Indianapolis.

Androphy Electric Co., 8 Oliver St., Derby, Conn.

A. J. Levinson, 80 Bank St., New London, Conn.

Kreiger & James, Conway, Faulkner Co., Ark.

T. S. Halverson, 212 E. 2nd St., Pomona, Calif.

Robert A. Bosch, 928 Geary St., San Francisco.

Domestic Electric Co., 208 E. 4th St., Davenport, Iowa.

Shelly Electric Co., 109 N. Water St., Wichita, Kan.

Dunellen Electrical Supply Co., 267 North Ave., Dunellen, N. J.

Ra-Tone Electric Co., 1267 Park Place, West Detroit, Mich.

Thor Electrical Shop, 130 Pearl St., Grand Rapids, Mich.

C. H. Mannison, Reed City, Osceola Co., Mich.

Radio Receptor Co., Manhattan, \$5,900 to \$15,900.

Triangle Radio Supply Co., Manhattan, \$30,000; L. Friedl, H. A. Linde. (Attorney, H. C. Adams, 220 Broadway, New York.)

Home Electric Shop, 254 S. Wabash St., Wabash, Ind., successor to C. W. Schlemmer.

Lawrence T. Baldwin, 742 Westcott St., Syracuse, N. Y.

Electric Parts Corp., 400 Boyden St., Syracuse, N. Y.

Webb & Cook Electrical Co., Asheville, Buncombe Co., N. C.

Amery Construction Co., Amery, Polk Co., Wis.

Apple City Electric Shop, Hood River, Oregon.

Radio Supplies AT A BIG SAVING

	List Price	Our Price
Radiotron UV 201 Amplifying Tube	\$6.50	\$5.85
Western Electric Phones, 2,200-ohms, Per pr.	15.00	13.50
Murdock Phones, No. 56, 3,000-ohms, Per pr.	6.00	5.40
Federal Phones, 2,200-ohms, per pr.	8.00	7.00
Acme A-2, Amplifying Transformers Semi-mounted	5.00	4.50
Paragon Amplifying Transformers, mounted	5.00	4.50
Federal Plugs	1.75	1.50
Eveready B Battery, Type 766, 22 1/4 Volt	3.00	2.50
Eveready B Battery, Type 763, 22 1/4 Volt	1.75	1.35
Braoh Vacuum Gaps for lightning protection, Inside Type	2.50	2.25
Outside Type	3.00	2.75
Paragon V.T. Sockets	1.00	.85
Paragon Rheostats	1.50	1.35
Thordarson Amplifying Transformers	4.50	4.00
Gen'l Radio Amplifying Transformers	5.00	4.50

All orders shipped the day of receipt, postage free. If you are not entirely satisfied with anything you order, return it and your money will be promptly refunded without question. Order from Gregory and save money. Send it in TO-DAY!

A. V. GREGORY 41 BROAD STREET
RED BANK, N. J.

SUBSCRIPTION BLANK

RADIO WORLD

RADIO WORLD CO.,

1493 Broadway, New York City.

Please send me RADIO WORLD for months, for which please find enclosed \$

SUBSCRIPTION RATES:

Single Copy \$.15
Three Months 1.50
Six Months 3.00
One Year (52 issues) .. 6.00
Add \$1.00 a Year for Foreign and Canadian Postage.

RADIO INVENTIONS
and other ideas promptly
patented by reliable
Patent Attorneys &
Engineers. Call or
write. **FREE ADVICE.**



**GUARANTEED
RADIO SETS & ACCESSORIES
NORTHERN RADIO SUPPLY
CO., Inc.**

14-16 Church St., New York
Mail orders promptly attended to.

FREDERICK WINKLER, Jr.

Manufacturer of
High Grade
Radio Phone Receiving Sets
Prices \$25 to \$135
59 Park Place New York City

ELECTRICAL SPECIALTIES

Auto — Electric & Magnet Wires.
Dealers write for magnetic wire price lists,
on 1- 1/2 and 1/4-lb. spools
RICHMOND ELECTRIC CO.
181 McDougal St. Brooklyn, N. Y.

—FOR IMMEDIATE DELIVERY—

We offer the following items of our
own manufacture:

Variable and Fixed Condensers.

Mounted Crystals. Crystal Detectors.
Distributors for—Grebe, De For-
rest, Federal, Acme, Thordarson,
Fada.

**WHOLESALE ONLY — LARGE STOCKS
RADIO SHOP of NEWARK**

(Telephone Market 9607)
41 1/2 SOUTH ORANGE AVE.
NEWARK, N. J.

Dealers: Forward Your Inquiries Promptly

**RADIO SUPPLIES—
RADIO SUPPLIES**

We carry a full line of Radio Goods

**Dictograph Head Sets, Vario
Couplers, Everett Head Sets,
Variometers, Transformers,
1700 Meter Loose Couplers,
Dials and Knobs.**

Send 50c for 20 Blue Print
Hook-Ups

Radio Sets Made to Order

SUNBEAM ELECTRIC CO.

71 3rd Ave., New York City

FREE! FREE! FREE!

With every Dollar purchase we will give absolutely
free six nickel switch points and two switch
stops. Magnet Wire per four ounce spool.

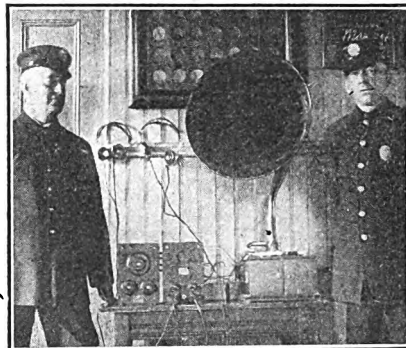
No.	Enamel	S. O. C.	D. O. C.
20	\$0.29	\$0.37	\$0.40
22	.31	.38	.41
24	.33	.44	.49
26	.35	.50	.56
28	.40	.62	.70
30	.42	.75	.80
28 Single Silk,	\$0.50	No. 40 S. O. C.	\$1.65

Variometer rotor and two stator sections
mahogany finish with necessary hardware, \$1.75
Wire in place, \$2.50 Complete \$3.50
Variocouplers parts less wire \$1.50
Wound, \$2.25 Complete \$3.00
Amplifying transformer \$4.00
Ground wire, No. 6, B. O. 7c per ft. \$6.00 per 100 ft.
No. 4, B. O. 9c per ft. 8.00 per 100 ft.
Send 5c for bulletin Radio and Electrical Supplies.
Send 40c for instructions how to construct your
own parts with diagrams of connections.
Parcel Post prepaid in U. S. 24 hour shipment
NEWCO RADIO & ELECTRICAL SUPPLY CO.
STRATFORD, CONN.

**From the Twenty-Four-
Hour-a-Day Boys**

Editor, RADIO WORLD: We have read every issue of your valuable and interesting paper, except the first number which we could not procure even by searching the stores of Boston. You have some very interesting pictures of radiophone sets. I am enclosing ours. We think we are the first fire station in New Hampshire, if not in New England, equipped with an R. C., Westinghouse set.

Our loud speaker consists of a Music Master Edison horn attached to a West-



Receiving set of Combination 3, Dover, New Hampshire, Fire Department.

inghouse victrola attachment by a piece of chemical hose, it works very satisfactory.

We have heard over twenty different broadcasting stations and ships.

The amusement of listening in certainly is wonderful and shortens the hours of those who put in twenty-four for a day's work.—L. H. Steuerwald, Combination 3, Dover, N. H., Fire Department.

A Chance for Inventor

RADIO has started the jokesmiths and humorists a buzzing. Perhaps one of them is responsible for the story of the woman, with charitable intent, who asked her municipal authorities to protect all cats that are obliged to sacrifice their whiskers to receiving sets. In her pity, the benefactress of feline hirsute adornment states that there are now 1,702,392 radio sets, each of which must have at least one cat's whisker; and that the time will come, if radio increases, when the supply of this important element will be nil, because "the atrocity is certain to develop whiskerless cats."

To many anxious inquirers

RADIO WORLD has no free list. One copy is sent as a voucher to each advertiser or advertising agent represented in current issues. All other copies are paid for on subscription or through the news trade.

2200-Ohm Head Phones

Bring in music loud and clear

VARIABLE CONDENSERS

43-Plate, .001 mfd., list \$4.00

23-Plate, .0005 mfd., list 3.25

**RADIO DEPARTMENT
Signal Systems Service Co.**

1 E. 42nd Street, New York City

You will find many Special Values in our display advertisement in Radio World issue of June 10 and June 24.

BEACON RADIO and ELEC. CO.
246 Greenwich St., N. Y. C.

A REAL VARIABLE

THE HAYNES VARIABLE CONDENSER was designed before it was built. IT DOES NOT LEAK. DEALERS—Here is a condenser worth twice its price, yet there is plenty in it for you. Write for particulars. We can make delivery.

The Haynes Radio Shop
629 Lexington Avenue, New York City

SPECIAL OFFER TO DEALERS
3 and 4 Inch Dials
Fixed and Variable Condensers
Klosner Vernier Rheostats
ALL RADIO EQUIPMENT
NEW YORK RADIOPHONE CO.
32 UNION SQ. — NEW YORK CITY

**VARIOMETERS
UNWIRED**

Mahogany wood turned cup, white wood ball ready for wiring. Range 175 to 600 meters. Ready for immediate delivery in any quantity. Workmanship guaranteed.

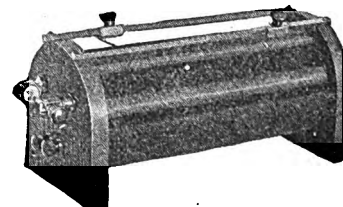
SAMPLE SET, \$1.10

The Ever Ready Woodworking Co.
810-12 East 5th St., New York City
Phone Orchard 5585

**HERE THEY ARE
EBY
BINDING
POSTS**
See them at your dealers
Ensign "H" Corporal
H. H. EBY MFG. CO., PHILA., PA.

**JOBBER—
—DEALERS**

Write for discounts on our
**"RELIANCE"
TUNING COIL \$5.00
CRYSTAL SET**



Wound with No. 21 enameled wire on specially treated tubing, neat in appearance, efficient in receiving, has a range of 600 meters.

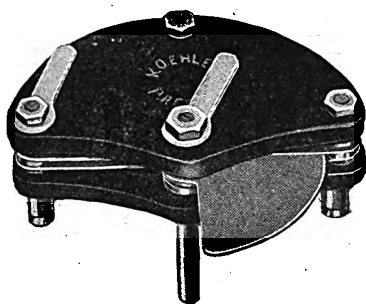
IMMEDIATE DELIVERY

We also manufacture:—
A small set at \$4.00

A 2 slide tuner at \$3.50

Unmounted coils in 3 sizes, 6x3, 8x3, 8x3 1/2" at \$1.00, \$1.25 and \$1.50 respectively.

RELIANCE MFG. CO.
354 Mulberry St.
NEWARK NEW JERSEY



3 PLATE VERNIER VARIABLE CONDENSER

Heavy aluminum plates, all parts of brass, nickel plated, molded composition ends.

Well made and separately inspected and tested. The best you can offer your customers.

Typical of our extensive line, which includes the products of fourteen of the largest manufacturers. Immediate delivery on all orders.

List, \$1.50. Attractive Discounts.

Send for Samples and List of Line.

WHOLESALE RADIO EQUIPMENT CO.

22 William St., Newark, N. J.

**RADIO WORLD
OUT EVERY 7 DAYS**

RADIO WORLD

PUBLISHED EVERY WEDNESDAY (Dated SATURDAY OF SAME WEEK)
FROM PUBLICATION OFFICE,
1493 BROADWAY, NEW YORK, N. Y.
TELEPHONE, BRYANT 4796
BY RADIO WORLD COMPANY

ROLAND BURKE HENNESSY, Editor and Proprietor, 1493 Broadway, New York.
FRED S. CLARK, Manager, 1493 Broadway, New York.

ASSOCIATE EDITORS:
ROBERT MACKAY
FRED. CHAS. EHLERT

SUBSCRIPTION RATES

Fifteen cents a copy. \$6.00 a year. \$3.00 for six months. \$1.50 for three months. Add \$1.00 a year extra for postage to Canada and foreign countries.

Receipt by new subscribers of the first copy of RADIO WORLD mailed to them after sending in their order, is automatic acknowledgment of their subscription order. Advertising rates on request.

Entered as second-class matter, March 28, 1922, at the Post Office at New York, New York, under the act of March 3, 1879.

IMPORTANT NOTICE:

While every possible care is taken to state correctly matters of fact and opinion in technical and general writings covering the radio field, and every line printed is gone over with a scrupulous regard for the facts, the publisher hereby disclaims any responsibility for statements regarding questions of patents, priority of claims, the proper working out of technical problems, or other matters that may be printed in good faith and on information furnished by those supposed to be trustworthy. This statement is made in good faith and to save the time and controversy over matters which the publisher cannot possibly have control.

Stations Heard

J. Martin Simmons, 2316 N. 19th St., Philadelphia. (Call—3 AP). 1 BIF, 1 BYF, 1 BRO, 1 PIE, 1 AFV, 1 GM, 1 RU, 1 AZK, 1 MD, 1 BNP, 1 AW, 1 HK, 1 QA, 1 BVD, 1 ASF.

2 AWL, 2 AAX, 2 AYZ, 2 DK, 2 DN, 2 TS.

3 BLL, 3 AWN, 3 ANN, 3 PO, 3 JH, 3 OB, 3 BUM, 3 DIS, 3 HJ, 3 BP, 3 BG, 3 ZO, 3 ANJ, 3 ANY, 3 BDM, 3 AEQ, 3 AJK, 3 ABO, 3 BFU, 3 BOI, 3 BJ, 3 NW, 3 GF, 3 UD, 3 ZA, 3 BZI, 3 BO, 3 BK, 3 ON, 3 LI, 3 AQR, 3 AAY, 3 BHW, 3 AZH, 3 AHK, 3 US, 3 EM, 3 CG, 3 IW, 3 RW, 3 AMW, 3 ASY, 3 UO, 3 FR, 3 LA, 3 ASC.

4 DG, 4 EA, 4 GA, 4 EU, 4 BN, 4 ET, 4 GL.

5 XA, 5 KD, 5 KJ, 8 GO, 8 FN, 8 BQ, 8 XD, 8 QR, 8 AFZ, 8 BTO, 8 WO, 8 BVA, 8 FT, 8 BUM, 8 II, 8 ZG.

9 AJA, 9 AMT, 9 AKC, 9 AK, 9 UU, 9 CP, 9 AJH, 9 AAW, 9 AGR, 9 AWX, 9 DBE.

Canadian: 3 JL, 3 BP.

XFI.

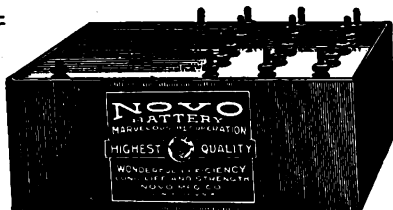
WL-2.

Phones: 3 ADT, 3 ANO, 3 AWI, 3 BJC, 3 AKU, 3 BW, 3 ANU, 3 AAE, 3 AND, 3 MS, 3 AR, 3 FS, 3 AMW, 3 FM, 3 GB, 3 UO, 3 ZO, 4 GL, 8 II, 3 ALW, 3 AQA, 3 HJ.

A. J. Charters, 728 Third Ave., New York, N. Y. (Call 2 AGU.)

1 ZE, 1 BHR, 1 BTL, 1 OAL, 1 ADC, 1 ADG, 1 ARY, 1 LZ, 1 UL, 1 BJL, 1 CP, 1 GM, 1 IN, 1 AA, 1 BOG, 1 BHR, 1 WO, 1 RI, 1 AKA, 1 BSZ, 1 KDZ, 1 CGU, 1 HK, 1 YK, 1 BKQ, 1 CMT, 1 BSD, 1 BCF, 1 HR, 1 CM, 1 BRO, 1 BAS, 1 CNF, 1 ADL, 1 BQE, 1 BDC, 1 BJW, 1 BKJ, 1 BLE, 1 VQ, 1 DZX, 1 ARB, 1 AW, 1 BDI, 1 CNI, 1 AIP, 1 DH, 1 BPZ, 1 BIZ, 1 AZK, 1 RD, 1 ALZ, 1 WZ, 1 PT, 1 CJA, 1 BTJ, 1 RV, 1 XM.

2 WB, 2 BPF, 2 BOX, 2 AQI, 2 DI, 2 AZZ, 2 BTJ, 2 BNS, 2 AKF, 2 ADV, 2 PF, 2 PS, 2 XK, 2 AQA, 2 EL, 2 LK, 2 AUL, 2 AJD, 2 BED, 2 GA, 2 PZ, 2 BRS, 2 AUL, 2 AJD, 2 BED, 2 GA, 2 PZ, 2 BRS, 2 BOY, 2 CCD, 2 BPF, 2 GK, 2 ZS, 2 CEC, 2 AZC, 2 ACY, 2 AGT, 2 CCX, 2 CEV, 2 AUF, 2 JH, 2 JZ, 2 OM, 2 AGT, 2 BEH, 2 AQU, 2 BE, 2 BEA, 2 JJ, 2 BLS, 2 CFA, 2 BBA, 2 AVR, 2 RM, 2 BXI, 2 CJI, 2 BZ, 2 BEH, 2 BUI, 2 BRB, 2 KV, 2 AFP, 2 RY, 2 AJN, 2 WT, 2 AB, 2 MM, 2 CBW, 2 ANZ, 2 CIZ, 2 ALO, 2 AMX, 2 BUQ, 2 BDG, 2 AQJ, 2 AOG, 2 BEB, 2 AVU, 2 ALT, 2 ZC, 2 UI, 2 BXTB, 2 AHL, 2 BRM, 2 BNZ, 2 BZI, 2 CCL, 2 AXK, 2 AAB, 2 VA, 2 BLP, 2 CLE, 2 FP, 2 KE, 2 BCQ, 2 KP, 2 CES, 2 BQU, 2 CIM, 2 FAF, 2 NZ, 2 BEM.



NOVO

"B" BATTERIES
FOR RADIO OUTFITS
Noiseless—Dependable—Guaranteed
All standard sizes 22½ to 105 volts.
For Sale by Leading Dealers

NOVO MFG. CO.

NEW YORK—424-438 W. 33rd St.
CHICAGO—531 So. Dearborn St.

Q. S. A.

ANTENNA WIRE

19 strands No. 27 Tinned Silicoon Bronze
1/3 greater efficiency over stranded and 2/3
over solid copper.
Greater signal and tensile strength.
Non-corrosive.

100 ft. Coil	\$1.50
150 ft. Coil	2.25
200 ft. Coil	3.00
250 ft. Coil	3.50
300 ft. Coil	4.00

Postage paid in U. S. A.

MAXUM RADIO COMPANY

5833 Woodland Ave., Philadelphia, Pa.
Send for FREE catalog of Radio Supplies

Everything in Radio

To The Dealer
From Parts to Complete Sets

Immediate Deliveries
Priced Right

Write for our Proposition
THE WOLBRACK CO., Inc.
1778 Broadway, N. Y. C.

VARIABLE CONDENSERS

At Popular Prices

11 PLATE, \$1.25
23 PLATE, \$1.75
43 PLATE, \$2.25

Mounted with Bakelite, 25c. extra
Guaranteed on Money Back Basis
Orders Promptly Filled.

RADER WIRELESS SPECIALTY CO.

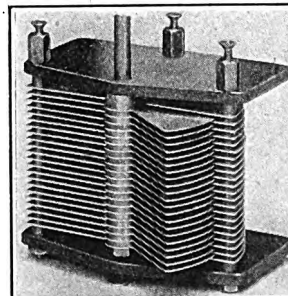
22 BEDFORD ST., NEWARK, N. J.

RADIOCRAFT

RIGHT—ALL WAYS
VARIABLE CONDENSERS

3 PLATE\$2.00
13 PLATE 2.75
23 PLATE 3.50
43 PLATE 4.25

Absolutely Guaranteed



A condenser built for all times—not to satisfy abnormal demand. Heavy Plates, Turned Brass Washers, ¼-inch Brass Shaft, Genuine Bakelite Ends, Positive constant contact on rotary plate-self adjusting.

DEALERS—JOBBER
We ARE making delivery.

Radiocraft Appliance Co.
203-205 Lafayette St., New York

RADIO WORLD'S QUICK-ACTION CLASSIFIED ADS

This department is intended for everybody who wants quick action on short announcements covering the buying, selling, exchanging or general merchandising in the radio field. Readers of RADIO WORLD will find that it pays to read these columns every week. Advertisers will get a ten-day service here—that is, copy received for this department will appear in RADIO WORLD on the news-stands ten days after copy reaching us.

The rate for this RADIO WORLD QUICK ACTION CLASSIFIED AD. DEPT. is 5c. per word (minimum of 10 words, including address), 10% discount for 4 consecutive insertions, 15% for 13 consecutive insertions (3 months). Changes will be made in standing classified ads., if copy is received at this office before 4 P. M. on any second Tuesday preceding date of publication. RADIO WORLD CO., 1493 Broadway, New York City. (Phone, Bryant 4796.)

SAVE MONEY—Supersensitive galema quarter pound, 55c., half pound, \$1.00. Big sample, 30c. Streiff, 73 Flatbush Ave., Brooklyn, N. Y.

Exchange jolly interesting letters through our Club Stamp appreciated. Betty Lee, 4254 Broadway, New York City.

PATENTS—Electrical cases our specialty. Pre-war charges. B. P. Fishburne, Registered Patent Lawyer, 386 McGill Bldg., Washington, D. C.

Storage batteries 100-120 amp. Rebuilt; guaranteed, \$9.00; new \$14.00; lightning switches, \$2.50; 37,000 volt insulators, \$0.20. Money back guarantee. L. M. Emery, Lyndonville, Vt.

Crystal Set That Gets Radio Concerts. Build it right boys. Plans and full instructions for building at low cost, high grade fine adjustable Crystal Receiving Set, fifty cents postpaid. Dept. R. D. Shaw Mfg. Co., Galesburg, Kans.

For Sale.—New Grebe OR-8 set, never set up. Cost \$80.00. First P. O. for \$65.00. One pair Western Elec. Head Phones cost \$15.00, first P. O. for \$11.00. Phones never out original box. D. G. Fox, 20 Fernwood Ave., Bradford, Mass.

INSULATORS FOR AERIALS—Support your antennae properly. Prevent current leaks. Our antennae insulators are of hard glazed porcelain, the ideal insulating material. Made to withstand a pull of 2,200 pounds. Light, strong, inexpensive. Write for samples and full information. THE FEDERAL PORCELAIN CO., Carey, Ohio.

GOOD TERRITORY STILL OPEN FOR LIVE DEALERS TO HANDLE OUR COMPLETE LINE OF RADIO INSTRUMENTS

Special Broadcasting Receiving Sets, Crystal and Audion, Radio, Audio Frequency and Power Amplifiers, Loud Speakers and complete line of parts. Complete details on request. LEE RADIO CORPORATION, HADDONFIELD, NEW JERSEY.

Enclose Self-addressed Envelope and receive free bulletin of various designs from which you may build your own Receiver from our blueprints. The blueprints show full constructional details, wiring diagram, bill of material and necessary data and we guarantee the performance of the model. Price of blueprints varies as to subject desired. Ask for bulletin No. 349. Experimenters Information Service, 220 West 42nd St., New York City.

Radio Memory Course, in 20 minutes. Lengthy study unnecessary. Learn Code, Alphabet and numerals in practically one reading. Send 25 cents. Mervyn Sales Co., 850 Penobscot Bldg., Detroit, Mich.

The "New Crystal" sensitive entire surface. Tested, mounted, \$0.50. Dealers Write. H. J. Davis, 200 Ridgewood Ave., Brooklyn, N. Y.

Manufacturers of Rogers Radio Receivers and Rogers Receiving Radiometers. Rogers Radio Company, 5133 Woodworth Street, Pittsburgh, Pa.

AGENTS WANTED in every city and town to sell standard radio apparatus. Attractive discounts given. If interested, write at once stating age and radio experience. Wilmington Electrical Specialty Co., Inc., 912 Orange Street, Wilmington, Delaware.

FOR SALE—Bargain detector set without tube, phones or batteries. Oak case, mission finish. Formica Panel \$10.00, list price, \$20.00. Two stage amplifier to match \$15.00, list price, \$25.00. Perfect working order. Goodwill, 224 E. 8th Street, Cincinnati, Ohio.

RADIO CABINETS—With all good tone chambers with or without phonograph combination. Any quantity in stock sizes or in order. Columbia Mantel Co., 175 Powers Street, Brooklyn, N. Y. Tel. Stagg 2726.

DETECT & AMPLIFY RADIO signals on ONE TUBE. NEW CIRCUIT permits same AMPLIFICATION now secured from TWO TUBES. Fifty cents brings detailed BLUE PRINT. NORTH WALES RADIO DISTRIBUTORS, NORTH WALES, PENNA.

One 2634 detector, two-stage amplifier, one 2598 regenerative tuner Amrad new, never used, cash \$85.00. Sherwin Electric Co., Burlington, Vt.

RADIO DEALERS AND AMATEURS DON'T BUY until you have investigated our line of Radio Instruments BECAUSE radio apparatus requires scientific knowledge and mechanical skill in the design and manufacture. Our experts have embodied these in our Special Broadcasting Receiving Sets, Audio, Radio-Frequency and Power Amplifiers, Loud Speakers and complete line of parts manufactured by us. LEE RADIO CORPORATION, HADDONFIELD, NEW JERSEY.

Big Money and Fast Sales—Every owner buys Gold Initials for his auto. You charge \$1.50; make \$1.35. Ten orders daily easy. Write for particulars and free samples. American Monogram Co., Dept. 198 East Orange, N. J.

VARIOMETERS AND VARIOCOUPERS: "BLIT RITE" Variometers and Variocouplers \$5.00; UV-200 \$5.00; UV-201 \$6.50; Fada Rheostats \$1.00; Tube Sockets (moulded) \$0.75; Thorderson Amplifying Transformers \$4.00; Dials \$1.25 and \$1.50. We handle a complete stock of complete sets and parts for immediate deliveries. Dealers and jobbers write for our Liberal proposition on Variometers and Variocouplers. L. W. Shollenberger Co., 602 North Second Street, Pottsville, Penna.

BARGAIN—Regenerative receiving set, wavelength range 175-2,500 meters. In perfect condition. Used only a few weeks. Cost \$65.00. First Money Order for \$40.00 takes it. Fifty foot, four wire antenna included. F. E. Barto, Oceanport, N. J.

\$1 A BATTERY—Storage Batteries become inoperative due to Sulphation whether the plates are new or old. The chemical process of de-sulphation is guarded as a Trade Secret and has been sold as such only to dealers. My guaranteed method will put practically any discarded battery in active condition. Price \$1.00. E. Grossman, 812 Walnut St., Philadelphia, Pa.

TYPE R-3 MAGNAVOX TYPE R-2 We can make immediate delivery on a limited supply of Type R-3 Magnavox, \$45.00, 14" Horn, and Type R-2, 18" horn, \$85.00. Dealers and agents, discount 10% on 1, 15% on 2 or more. C. O. D. or cash with order. THE KEHLER RADIO LABORATORIES, Abilene, Kansas, Dept. W.

The Standard Radio Log and Record.—A Continuous Diary and Record of all station activities. Provision for recording Calls Received and Sent with location, distance, wave length and other information. Sections for keeping records of Calls Frequently Used, Station Data, License Numbers, Equipment Inventory, Notable Performances, etc. Flexible binding, 48 pages and cover. Price 80c., prepaid or from your dealer. Metcalfe Publishing Company, 56 Harrison Ave., Springfield, Mass.

Radio Supplies At a Sacrifice

Here is a wonderful opportunity for a retail Radio Service Supply House

A manufacturer of Newark, N. J., U. S. A., desires to dispose of his very complete, well balanced, retail stock of Wireless Supplies, mostly all Standard Lines, to enable him to confine his energy to the manufacturing and exclusively.

Approximate inventory \$4,500 which includes a goodly supply of Phones and Bulbs. For a quick sale will sacrifice for \$2,550 in cash or negotiable securities. Inventory List supplied on request.

Address: C. B. TISSOT, "RADIO WORLD," 58 Schaeffer St. Brooklyn, N. Y.

Balking at What the Public Really Wants

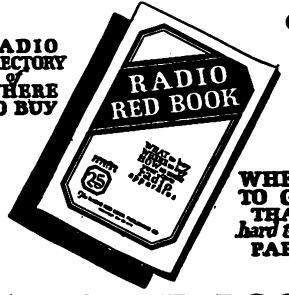
IN an interesting communication to the New York "Times," June 3, Mr. Allison Keyes, a resident of Brooklyn, N. Y., makes a plea for more ambitious programs from the broadcasting stations. Mr. Keyes says in part:

But when—oh, when—will this new super-power be used as the vehicle for other things than the commonplace, the trivial? "Ain't It a Shame to Steal on Sunday?" upon one radio program last week must, of course, have had a wide appeal, and I am aware that most radio sets are installed in homes because the males of the family want to hear the baseball scores at a minimum expenditure of time and strength. But when may some of the rest of us who balk at "what the public wants" listen in? Surely we should be allowed our turn. "Bits From the World's Best Literature" radioed the other evening sounded like a step in the right direction, but many of us would like a longer stride: When will Julia Marlowe (or a voice like hers, if such a voice there be, which I very much doubt) read us Shakespeare by radio? Thousands would enjoy it and through it the millions might be converted to Shakespeare—propaganda of a very safe and sane sort. The result might even cast doubt upon Mr. William H. Brady's classic of the theatre-ticket broker who said: "Honest Bill, I can't sell Shakespeare!"

What a triumph if we could sell Shakespeare by radio!

Subscribe direct or through your news dealer. \$6.00 a year.

—something different?



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Get a copy from your radio dealer or
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PUBLISHED BY
Pacific Radio Pub. Co., Inc.
Pacific Bldg., San Francisco

Radio World, 52 issues, \$6.00

RKM for This Week

By Roy K. Moulton, the famous humorist of "The Evening Mail," New York. Copyrighted by Mail and Express Company.

DEPARTING from the custom of other broadcasting stations, we have decided to insert a little pep into the programs sent out from here. The RKM station has become so popular that there has not been sufficient listening space for all those who wished to hear and on several evenings we have been forced to broadcast two programmes at the same time.

Our programme for next Monday evening will deal almost entirely in topics of current interest and will be as follows:

7:10 P. M.—Reading of the minutes of previous meeting.

7:22—New Business. Motions and resolutions.

7:39—Initiation of candidates. No horse-play or rough-stuff.

7:57—Sketch: "Damon and Pythias," by Senator Caraway and Attorney-General Daugherty.

8:09—"My Impression of America," by Laddie Boy, the White House Airedale.

8:27—Dance music by Chick Binks' famous Pousse Cafe Tin Can and Frying Pan Orchestra.

9:01—Aerial performance by Miss Lillian Leitzel, queen of the circus.

9:27—Exhibition by Wide Awake Hose Company No. 1, of Rutherford, N. J., including getting into uniforms, sliding down brass pole, putting out fire and reeling up hose.

9:51—Exhibition of speed in mid-Atlantic by steamship Majestic, largest liner afloat.

10:00—Correct time from the Sunshine Biscuit factory.

10:23—Canned music by Cool & Schaller, the famous Washington Heights trout-stream twins, during which they will break several records.

10:38—Addresses by Polk & Co., authors of the city directory.

10:49—Light refreshments served by Izzy Einstein, the well-known caterer.

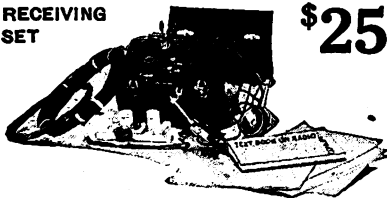
11:00—Good night.

Does the Moon Affect Radio

The changes of the moon have been found by radio officers of the small American fleet in the Adriatic Sea to have a striking effect upon the efficiency of the atmosphere for transmitting radio communications. The officers have succeeded in drawing curves and other diagrams based upon months of observations, which, they assert, reliably serve to indicate what atmospheric and celestial conditions affecting radio service will be met at any particular date in the future.—The New York "Telegram."

"MIRACLE"

RECEIVING SET



\$25

With Double Head Phones

Also Copper Antenna Lead Wire, Ground Wire, Insulators and all the necessary parts that will enable you to hear everything within a range of from 25 to 50 miles. Also included is a radio text-book with complete instructions and valuable charts.

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No fuss, trouble, dirt—no moving of batteries—loss of time—no effort on your part—no technical or professional knowledge needed.

THE HOMCHARGER successfully meets all charging conditions, and is the only rectifier combining the following essential Homcharging features.

1. Self-polarizing. Connect battery either way and it will always charge. No danger of reverse charging, ruined battery or burnt-out rectifier.
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Approved by Underwriters. Immediate Delivery. Attention Motorists. Will charge your auto battery as well as radio battery. Send for Bulletin No. 58 for further information. For sale by all radio, electrical and accessory dealers or shipped, express prepaid, for purchase price, \$18.50. \$20 West of Rockies

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BRANCH OFFICES—New York, Chicago, Pittsburgh, Los Angeles, New Orleans, Detroit, Toronto, Philadelphia, Baltimore, Dallas.

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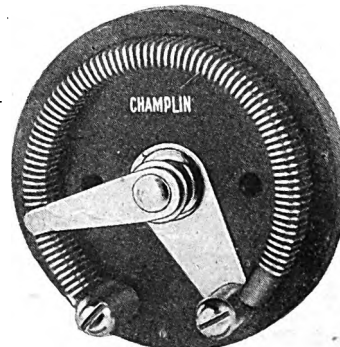
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To Mr. Garrick: "73s"

Editor, RADIO WORLD: I have read Mr. Garrick's letter in RADIO WORLD No. 4, dated April 22, and want to say that I agree with him in every particular. To Mr. Fancher, of 1BVB, I would say that he misunderstood the right meaning. Mr. Garrick doubtless meant the cheap crystal sets which are being sold to the unknowing public. (Usually by displaying them on the counter and having a two-or three-step amplifier hidden from view and hooked on to a loud speaker).

As for Mr. Abbot, I would suggest that he become better acquainted with the American amateur and learn about his work and aims. Does he know that the amateurs handle thousands of messages every month in all parts of the country, free of charge? Is that a public benefit or not?

We amateurs have organized our own American Radio Relay League, which day and night, is striving to attain a state of perfection that will enable messages to be sent with safety and accuracy to any part of this country and in less time than by any other method.

Last year, we sent a message from Hartford to Los Angeles and received an answer in six and a half minutes!

In other tests, our stations have been heard in England, France, Germany, Alaska, Honolulu, etc. Does such work mean anything, or is it to be curtailed just because someone wants to sit down at night and hear the "wonderful music?"

We have enough to put up with now. If a station near a broadcasting center wishes to do some work he has to wait until midnight; for if he tries it before, his receiver is overwhelmed with a wondrous array of music, beat notes, harmonics, etc.

And to Mr. Garrick-73s., de A Rechert, 2TT.

Are You Going Away For the Summer?

If you are on our subscription list, send in your change of address.

If you purchase RADIO WORLD at the newsstands, and intend to leave town, we suggest that you subscribe direct or through your newsdealer at \$6.00 a year, \$3.00 six months, \$1.50 three months, and have RADIO WORLD reach you regularly while you are away.

RADIO WORLD,
1493 Broadway, New York, N. Y.

THE MARVEL OF WIRELESS

REG. U. S. PAT. OFF.

OF WIRELESS

If you live within 80 miles of a radio broadcasting station, you can bring the speeches and music right into your own home with the nationally famous MARVEL! The set comes complete, including telephone headset, complete aerial equipment, aerial and ground wires, lightning switch, insulators, ground clamp, complete, simple instructions, Complete code chart, etc. Nothing additional needed.

Remember, the MARVEL is built by the same engineering skill that designed radio apparatus now used by the U. S. Navy, and every MARVEL Set is on a money-back basis. If your dealer is not supplied, send check or money order for immediate shipment from stock. \$1.50 extra will bring you an interesting book on wireless—150 pages, 150 illustrations. Or send 25c for a 72-page illustrated beginner's radio book.

FREED - EISEMANN

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KEYSTONE VARIABLE CONDENSERS

21 Plate
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Our selection of materials and built-up type design give assurance of low energy loss and high efficiency.

Agents and Jobbers write for information.

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To those who are looking for satisfactory performance, De Forest Radiophones also present technically correct design, handsome appearance and unequalled efficiency. De Forest Reputation and Prestige insure the quality of the workmanship and materials used being of the highest.

The Everyman Receiver is for 30-mile reception; the Radiophone Receiver is a vacuum tube set efficient up to 100 miles; for use with either of these sets there is the "DT-800" Two-Stage Amplifier. MR-6 Receiver includes an unsurpassed tuner, tube detector and two-stages of amplification. Ask your friends who use them.



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Eliminates outside and inside wires. This attachment will enable you to use any electric-light socket in your home. No danger of any kind, no worry from storms. Save cost of all aerial construction. Attachment comes ready to connect to your receiving set. Fully guaranteed. Price \$3.50 postpaid.

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Write at once for "Sparks" devoted to the outlook for this corporation. There is no obligation on your part.

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How to Learn the Code

MORE than half the pleasure of owning and operating a radio-receiving outfit is lost if code messages cannot be understood.

In learning the code, the easiest way is to call the dashes "da" and the dots "dit." Most of the letters should be learned in pairs, as follows:

E—dit.
T—da.
I—dit, dit.
M—da, da.
S—dit, dit, dit.
O—da, da, da.
H—dit, dit, dit, dit.
A—dit, da.
N—da, dit.
U—dit, dit, da.
D—da, dit, dit.
V—dit, dit, dit, da.
B—da, dit, dit, dit.
W—dit, da, da.
G—da, da, dit, dit.
L—dit, da, dit, dit.
F—dit, dit, da, dit.
R—dit, da, dit.
K—da, dit, da.
P—dit, da, da, dit.
X—da, dit, dit, da.
Q—da, da, dit, da.
Y—da, dit, da, da.
C—da, dit, da, dit.
J—dit, da, da, da.
Z—da, da, dit, dit.
—dit, da, da, da, da. 2—dit, dit, da, da, da.
3—dit, dit, dit, da, da. 4—dit, dit, dit, dit, da.
5—dit, dit, dit, dit, dit. 6—da, da, dit, dit, dit.
7—da, da, dit, dit, dit. 8—da, da, dit, dit, dit.
9—da, da, da, da, dit. 10—da, da, da, da, da.

This all looks foolish and sounds like baby talk, but it will produce results. The object of learning the letters in this way is to know them by their sounds rather than by their appearance; in other words, *by ear and not by eye*. Practice during spare time by translating newspapers, magazines, car signs, etc., into "da-dits."

A telegraph key, buzzer and dry battery form a small, inexpensive means of producing "da-dits" so that they sound like regular wireless signals, and will provide educational entertainment for any one or for any group of people who are at all interested in radio.

If you wish to enjoy radio to its fullest, take advantage of this.

LISTEN-IN PHONES

Retail at
Factory Prices.

Enjoy your Radio
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Specialty
Phone. Absolute
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PRICE \$5.85

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Three reasons why we highly recommend these phones.

1. Highest quality of material used throughout.
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Very Liberal Discounts.

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\$1.00 PER SHARE

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RADIO APPARATUS

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PHANTOM ANTENNA

Reduces static, eliminates lightning arrester and unsightly outside aerial. Ideal for apartments and city users who cannot erect aerial.

Fine oak cabinet and nickel fittings with green silk cord and plug ready to attach to nearest lamp socket. Price postpaid \$5.00. Dealers and jobbers wanted.

A. C. PENFIELD

Conneautville, Pa.

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Get the Radio Programs
Free of that Summer
Pest—Static, at a cost
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JACOBUS

Static is not a necessary evil with any kind of receiving set. You can get the programs as clearly in summer as in winter.

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Static can be drained off your lead-in wire as water is carried from a roof—automatically. Just say **JACOBUS** to your dealer or show him this ad.

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You can see the sparks sifting through the vacuum lamp harmlessly to the ground. Even lightning cannot reach your set. The Watchdog, "JACOBUS," protects your set and home. Write for free circular giving hook-ups and advice on static elimination.

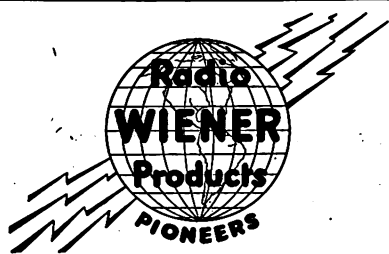
Ask your dealer about it

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79 Orange St., Newark, N. J.

VEST POCKET RACE TRACK

Wonderful novelty. Absolutely new. Beautifully nickel-plated Race Track Watch. Miniature track. Twelve numbered horses. Watch them run. Fascinating sport. Descriptive letter on request or watch mailed prepaid for \$1.50. KARL KNIGHT, Dept. R, 49 Hanover St., Boston, Mass.



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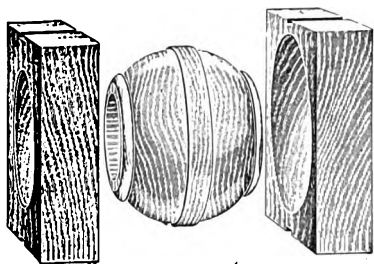
A New "Ham's" Views

Editor, RADIO WORLD: I noticed, in your issue of April 22, an article signed by Ralph R. Garrick, operator JART 3 P.M. I would like to express my opinion of this article and its writer.

It is, without doubt, the most narrow-minded statement I have seen in many days and, certainly conveys the impression that the writer has a cramped intellect. It is this type of man who impedes progress. As for answering some of the statements, I will first say that I am one of the new "hams" and am, also, one of his nineteen of the twenty. I do not claim to be able to tell anything about wireless. However, if he will look around him, he will find that his class is in a very decided minority and should expect consideration in the same proportion. The broadcasting stations are accomplishing more good in one evening than this man and his kind, unless they change their attitude, will accomplish in a lifetime. He does not seem to realize that there are many invalids and many people living at distant points who are receiving, by wireless, their only form of wholesome amusement and entertainment. If this man, Garrick, is such a clever radioman, why does he not arrange to operate at a wave length so that the broadcasting stations will not interfere with his joy of living? —James H. Hoeveler, President, Hoeveler Warehouse Company, Pittsburgh, Pa.

Louis Dreyfus, Broadway musical publisher, gave C. B. Dillingham, the theatrical manager, a box of cigars when the latter sailed for Europe last week. Two days later, he received the following wireless from "S. B."; "Thanks for the cigars. They made me seasick."—The New York "World."

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126 Liberty Street, New York

Carefully and accurately made from specially selected and treated woods. Not "mere wood turnings" but manufactured to pattern makers standard.

Rotors packed 50 and 100 in package. Stator sections packed 100 and 200 in package.

Dealers! Send for interesting circular and attractive proposition. Write Dept. 46.

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RADIO

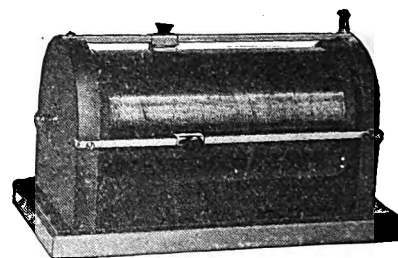
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Federal Head Phones, 2,200-ohms..	8.00
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Sets and Parts



**Mayer Double Slide
Tuning Coil**

A most efficient double slide tuning coil wound with bare, highly polished, hard drawn No. 26 B. & S. copper wire. The strands are .0012" apart and are immovable. Mounted on a durable wooden frame, base and slides beautifully finished in mahogany. Can be used for loading coil.
Base 10 1/2 x 5 1/4 inches. Height 6 inches.

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The radio dealer needs a new kind of jobber service to meet the demand of a new and different business. North Ward Service is developed especially to meet the need. Give it a trial!

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- No. 30. Single Circuit Open.
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- No. 31. 3 Spring Automatic Filament Control.
- No. 33. 5 Spring Automatic Filament Control.

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Binding Posts (unremovable head).
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Complete Knockdown Radio Receiving Set

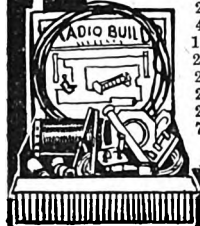
Complete with Plans, Aerial, Lead in Wire. Coils, Detector, Switch, Insulators and all necessary parts. Easy to set up. This set without Head Sets.

Head Sets at 50c. below the list price.

SPECIAL SALE PRICE

\$1 7/22 Aerial Wire 100 Ft.	71c	\$3.60 Light'g Grd. Switch	\$2.50
75c—No. 14 "	49c	\$1 3" Dials, Hard Rubber	75c
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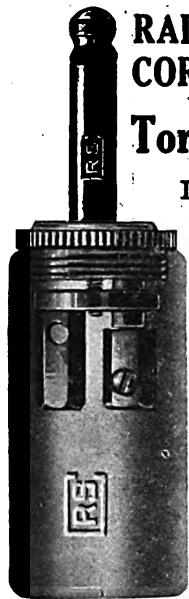
By JAMES R. CAMERON

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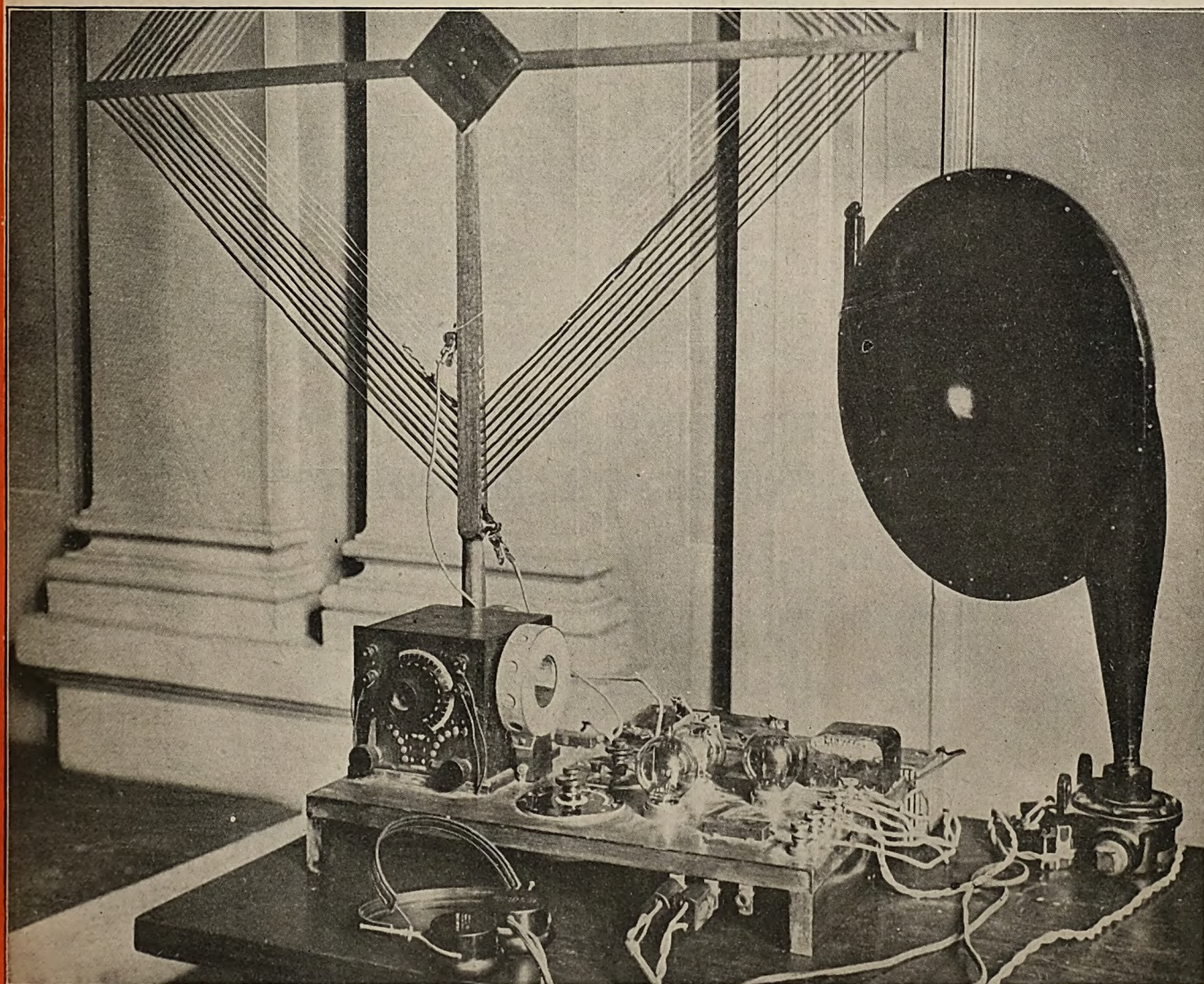
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RADIO WORLD

Entered as second-class matter, March 28, 1922, at the post office at New York, New York, under the act of March 3, 1879

I L L U S T R A T E D

Latest Radio Revolutionizing Invention. See Page 8.



Major
Edwin
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which
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Radio
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100,000
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How to Make Your Own Radio Cabinets

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How to Make Your Radio Cabinets

By *W. S. Standiford*

MANY amateurs are constructing radiophone sets, and many of their instruments work well until the spaces between the leaves of the variable condenser and jacks clog up with accumulated dust. Then trouble occurs. In order to make their apparatus give the least amount of trouble, manufacturers of radio sets enclose them in a wooden cabinet which not only adds to their appearance, but also to their efficiency.

In sharp contrast to this, most amateurs do not enclose their outfits in a case, but try to keep dust away from the delicate parts by frequent cleaning—a process that not only wastes time, but is liable to press some wire connections too close together and out of shape; thus making other difficulties during operation. As a general rule, most electrical experimenters can make neat looking cabinets, but fall down in their finishing work, which is very crudely done and mars the appearance of their completed set. This is due, in most cases, to lack of knowledge of the processes and materials needed to do a good smooth varnishing and polishing job, rather than to carelessness.

Varnish is used as a base for many finishes, whether it is used for automobiles, furniture, or radio outfits. This work is very easy to perform, but certain precautions must be taken if a satisfactory result is desired. It is of the utmost importance to have a clean smooth surface in order to get a first-class finish. At the outset, it cannot be emphasized too strongly, that a smooth exterior is necessary whether the wood is to be painted, enameled, oil-finished in natural colored woods or stained and varnished. The first thing to do is to decide on what kind of wood the box is to be made of, whether it is open or close grained, and, also, if it contains any sap, as such things will cause different methods of working to be adopted. This is a matter of the utmost importance and should be looked into before proceeding with the work. In order that the amateur may not go astray, a list of open and close grained woods are appended, the handling of each kind will be described later in this article.

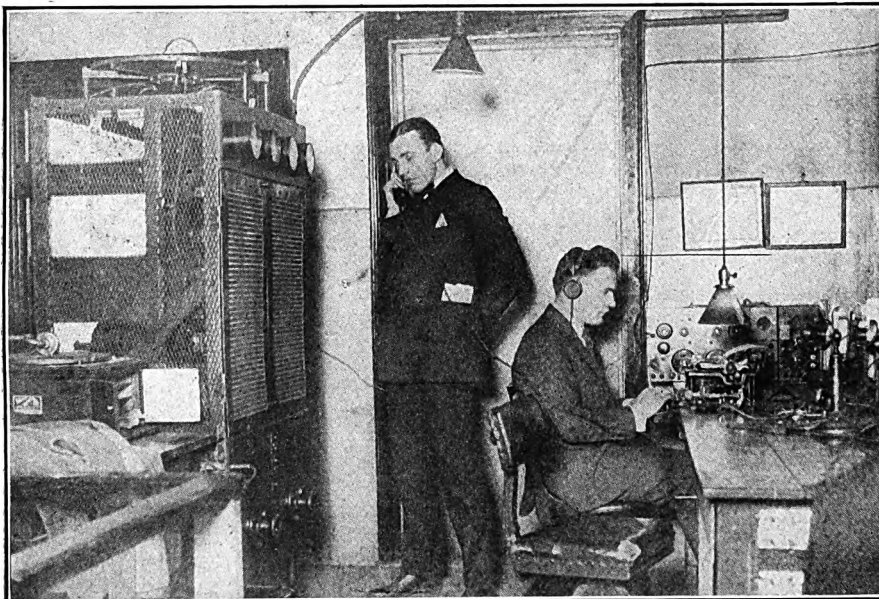
Open-grained woods: oak, ash, chestnut, walnut, mahogany, butternut. These require fillers.

Close-grained woods: pine, cherry, maple, birch, cypress, whitewood, poplar, sycamore, beech, redwood. These and others like them do not need fillers, but can be finished in natural colors or stained as the builder prefers.

Five operations in wood finishing are necessary, although, in the case of close-grained woods, the filling process can be dispensed with. For varnished cabinets, sandpapering, staining, filling, varnishing, and the final polishing comprise the list. Directions for each process will be given in rotation as the work progresses. Plane the wood as smooth as possible then tack a piece of 00-sandpaper on a level block and rub with the grain, using moderate pressure and taking care, when working near the edges, not to round them. Wipe all dust from surface with a cloth. Staining comes next if pine or poplar are used to imitate the appearance of the more costly woods. By using the former, radio-set containers can be made which will look as if an expensive natural-colored wood was used. In wood finishing, much trouble in working will be avoided by the purchase of the best stains obtainable. There are two kinds of stains on the market; water and oil stains, each having its good points. Oil stains are those in which the coloring pigment is dissolved in linseed oil, or turpentine; water is the solvent for the other. As pine wood, in some cases, has more or less sap, this wood after coloring with an oil or water stain when they are dry; should have two coats of white shellac-varnish put on; each coat after drying is to be lightly sandpapered.

This shellac coating effectually keeps any sap from discoloring the finish after the work is done. Varnishing, rubbing down and polishing can then be proceeded with. The best way to use water oil stains is to apply it with a brush and then rub it into the wood with a piece of cheesecloth. This distributes the color evenly and absorbs surplus moisture (which in the case of water stains is apt to raise the grain of the wood, thus making more sandpapering necessary, and also makes a uniform color tone). If the first application does not give as deep a color as desired, give it another. If the amateur desires to use an open-grain wood, such as mahogany or walnut, and use stains to

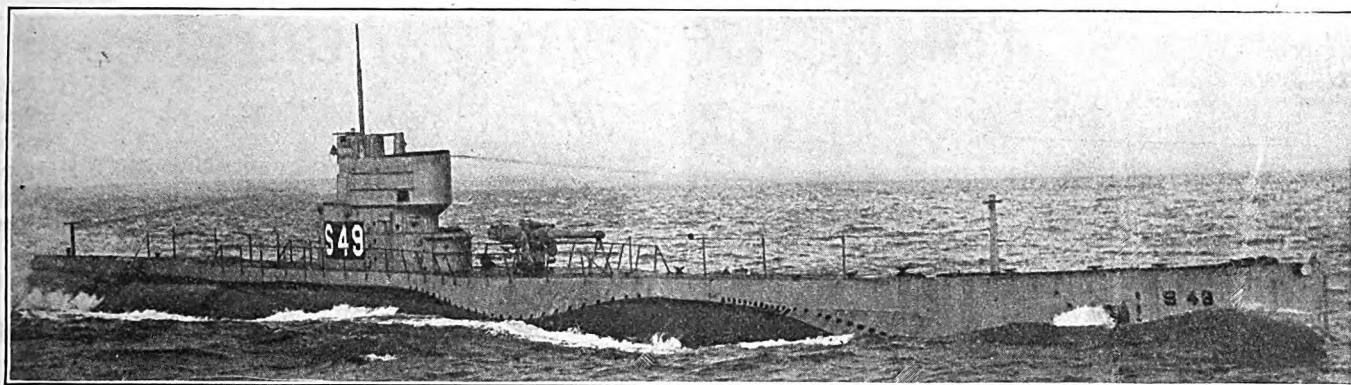
Chicago Radios Market Reports



(C. Underwood & Underwood, N. Y.)

The Chicago Board of Trade has put in operation a system of sending the opening and closing quotations of the wheat, corn, and oats market broadcast throughout the United States by radio. The quotations are sent from KWY, the Westinghouse Electric and Manufacturing Company, Edison Building. The man at the desk is receiving a message from Cuba. The man standing is verifying outgoing quotations.

Latest U. S. U-Boat Carries Radio



(C. International)

S-49, the latest type of submarine built by the United States Navy. She is one of the most heavily armed craft for under-seas purposes, and is equipped with radio, which can be operated while she is submerged.

(Continued from preceding page)

make them deeper in color, the pores will have to be filled after staining, otherwise staining can be omitted—but not filling, which is necessary. Suppose that such wood has been stained. Get a paste filler of a color to match the stain as nearly as possible. Put some of the filler on a piece of cotton cloth and rub it on the wood. As soon as this filler has dried a little (don't let it get hard), continue to rub the surface until all pores have been filled up, rubbing off the surplus, the idea being to have nothing but the pores contain filler.

After it is dry and smooth, give it a coat of white-shellac varnish. It ought to be rather thin; dilute with alcohol if too thick. All surplus varnish must be wiped off the brush before application to the surface, for if too thick a coating is applied, it will not be clear and allow the stain to show. The first coat of shellac should dry in about three hours, after which, put on another coat. Rub the dried surface with the finest-grained sandpaper until the wood is smooth. Don't rub it too hard, or the shellac will be cut through.

Varnishing comes next. Good brushes should be used as cheap ones will not give good results, as the bristles come out. Varnish must not be too cold as this prevents it from flowing freely. Have enough varnish on the brush to just give a level coating when it is brushed across the grain. Finish off by lightly rubbing with the grain, letting it dry thirty hours, or until thoroughly hard. If varnish is too thick, put a little turpentine in it.

Purchase some FF grade of pumice stone and a rubbing felt. Dip the felt into linseed oil, then rub on pumice stone which will now adhere to the felt. Now rub the varnished surface

lightly along the grain of wood. Continue this process until all small depressions have disappeared. This may be observed by looking diagonally over the wood's surface when it is held to the light. All hollow places will now show as dark spots. Surplus pumice stone must now be removed with a soft cloth.

Give it another coating of varnish and repeat the operation with pumice stone. The cabinet will now have a "dead non-glossy" finish. Those who prefer a shining polish can easily obtain it by dipping a piece of felt into linseed oil and powdered rotten stone; and by going over the surface in the same manner as with the pumice stone. A higher polish may be obtained on the last coat by giving it the rotten-stone treatment and then rubbing the hard varnish with a soft cloth dipped into linseed oil and using plenty of "elbow grease" until a very high polish is the result. The surplus oil should be wiped off with a soft chamois skin. The above gives a durable finish; one that will not scar easily. If all of the work has been done carefully, the radio fan will have a neat-looking cabinet that will be envied by his friends who do not understand polishing work. Varnished and polished woodwork of all de-

scriptions should not have any strong soap-powders applied for cleaning purposes to remove finger marks, etc.; as it will turn white in spots. Use nothing but a good furniture polish which will be found to clean it nicely.

Difficulty.—The finished work has a mottled appearance, some parts being deeper in color than others.

Remedy.—This is due to the staining being unevenly done; some places are left lighter than others due to too much stain being used. Sandpaper the darker spots carefully and spread a little more of the stain on the lighter ones so as to make an even tint; then finish surface as directed in article. Another rapid way to produce a fine finish on cabinets made out of close-grained woods is: first coat the wood's surface with shellac varnish, well rubbed in and sandpapered to kill any pitch in wood, and next put on two coats of a combined varnish-stain, one at a time, the first coat to be rubbed down with pumice stone and the last coat put on and when dry polished with rotten stone and oil or left the way it is. A first-class spar varnish-stain makes an excellent wearing surface, as it doesn't crack with use and will not turn white in spots after long use.

Owing to their composition, they ought to be put on like a varnish and not be brushed on like the ordinary variety, it not being made to spread that way.

Difficulty.—The work has a lumpy and uneven appearance.

Remedy.—Sandpaper smooth and dilute material in can with a small quantity of turpentine, stirring well from the bottom of can to dissolve any lumps. Use a small amount on brush and flow across grain of wood. After drying thoroughly apply another coat spreading with grain of wood.

To Find a Sensitive Spot

Editor, RADIO WORLD: Radio fans who cannot find a sensitive spot on galena should try this idea:

Get a file and file the surface of the crystal. Put the crystal back into the cup and press the catwhisker against the filed surface. I have tried this many times, and have always had excellent results.—John Camarda, 3316 Church Ave., Brooklyn, N. Y.

The most remarkable thing about the rapid spread of radiophones is that it has occurred without a law forbidding it. —"The Sun," Baltimore.

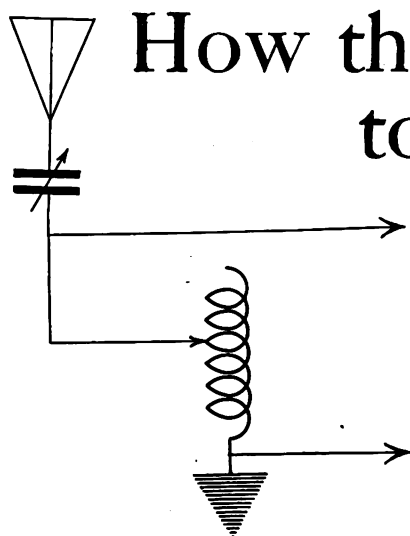


FIG. 1

A single-circuit conductive-type receiver. Suggested by C. J. Williams. Drawn by S. Newman.

THE method of receiving radio-frequency currents, after they have passed through the necessary tuning-apparatus, is to convert or change them from radio frequency to audio frequency, and also to change them to direct current, in order that they may operate a telephone receiver.

This changing is done by a means or device known as a detector. There are several kinds of detectors, but only two are in common use: One is the so-called crystal; the other, the vacuum tube. It was explained in the description of tuning that an inductor, wire wound into some form of coil, was used in the antenna circuit. Besides its use for tuning, the inductor is used to connect the detector. There are two ways of doing this. These are shown in Figures 1 and 2. Figure 1 shows a "single circuit" connection. In this, the detector apparatus is connected directly to the terminals of the inductor. Sometimes better results are obtained by connecting the detector across part of the coil, instead of across all of it. The best fraction of the whole coil to use is from one-third to one-half of the coil. The other way of connecting the detector to the antenna is not a direct one, and is shown in Figure 2. In this method, the antenna circuit-inductor is one winding of a transformer, the other winding of which, called the secondary, is connected to a condenser.

This transformer is often called a coupler, loose coupler, or vario-coupler. It is a coupler in the sense that it couples together, electrically, the antenna circuit and the secondary circuit. The secondary coil has currents induced in it by currents flowing in the primary coil when the two are placed near each other. In the usual radio coupler, the secondary coil is made movable in regard to the primary, so

By C. J. Williams

that the effect of the primary on it may be regulated. In the two-circuit receiver, all the principles and rules of tuning and resonance which have been described for the antenna circuit apply equally to the secondary circuit. So that, in this type of connection, which is called a two-circuit receiver, there are two circuits instead of one to be tuned to the wave length to be received; also, the coupling between the two circuits must be adjusted for best results. It is obvious that the one-circuit receiver is very much more easily adjusted than the two-circuit. The two-

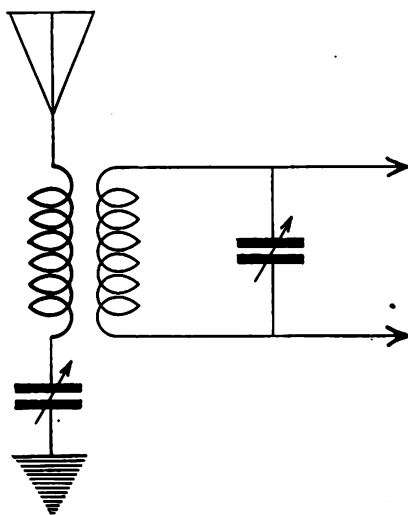


FIG. 2

The inductive method of coupling a receiver. Suggested by C. J. Williams. Drawn by S. Newman.

circuit receiver, on the other hand, is more selective; that is, when it is tuned to one certain wave length, currents of other wave lengths get through it to the detector less than they do on a single circuit receiver. The two-circuit receiver is, therefore, more useful in eliminating interference from undesired signals, and the single-circuit receiver is advantageous in its simplicity of tuning operation.

In either the one- or two-circuit receiver, the detector is connected to an inductor; the difference is merely that in one it is to the inductor in the antenna, and in the other to the one in the secondary, so that whenever currents flow in the inductor the voltage which is present across it is applied to the detector.

In explaining, the action of a crystal detector is merely that of a rectifier—that is, current can flow through the

detector in one direction only, so that when alternating current, which flows in two directions alternately, is applied to it, the current flow in one direction gets through the detector and the flow in the other direction does not. This, in effect, changes the alternating to direct current.

Of course, this direct current is a pulsating one, because no current is flowing during the time that the alternating current is applied in the wrong direction to get through, but the effect is the same. The pulsating direct-current flows through the telephones as well as the detector, as they are connected in series, and this operates the telephones. In radiotelephony, the alternating current which is received in the tuning elements is varying rapidly up and down in strength just as the transmitter currents vary in accordance with the speech or music sound vibrations. And the pulsating direct current which results through the detector and telephone varies the same way. Therefore, the telephone-receiver diaphragms are pulled back and forth by the magnetic effects of the currents in their windings, and so give off sound waves.

A vacuum tube may be used as a rectifier, or detector, of high-frequency oscillations. When connected up to the proper circuit, it performs this function with as much efficiency as the crystal detector. The vacuum tube, when connected up to a tuning device and used as a rectifier of electrical oscillations from distant transmitting apparatus, will work with a satisfactory degree of efficiency and, also, uniform sensitivity.

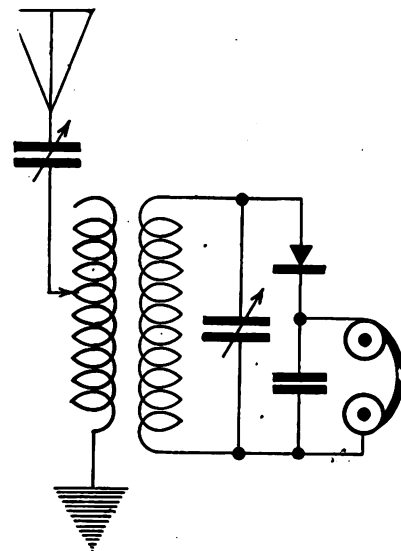


FIG. 3

Schematic diagram of a crystal inductive-type receiver. Suggested by C. J. Williams. Drawn by S. Newman.

How to Construct a Long-Wave Regenerative Receiver

By George W. May, R. E.

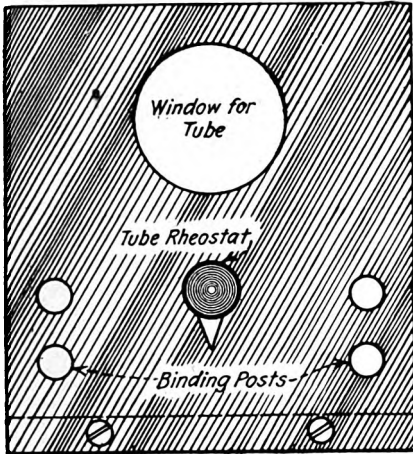


FIG. 1

How the front panel should appear. Suggested by G. W. May. Drawn by S. Newman.

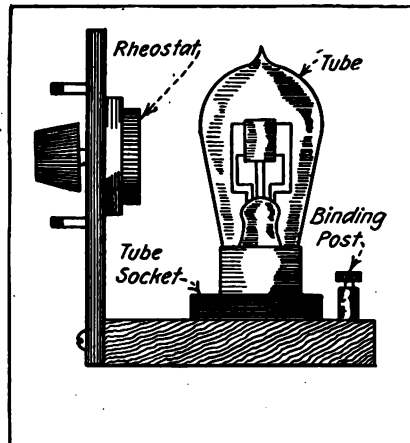


FIG. 2

A side view, showing the position of the tube-socket holder and rheostat. Suggested by G. W. May. Drawn by S. Newman.

RADIO amateurs who intend to advance into the tube class, and are serious of thinking of building a tube set, will find that the regenerative, or feed-back circuit, if placed in a receiver, presents many points of superiority over the crystal type of receiver. This feed-back, or regenerative circuit, is more selective, more sensitive, and provides for considerable amplification of signals, through the phenomenon of regeneration. There is no question that a little skill is required in constructing the set, which in turn would bring better results. Although more complex in operation than the crystal set, the results obtained warrant the extra trouble and expenditure of money.

Because of the fact that there are broadcasting stations on long waves well as short ones, a receiver which will respond to a range of wave lengths between 200 and 1700 meters proves interesting as well as useful. There is certain pleasure in being able to shift from one wave length to another and intercept signals from various stations at will. Instead of standing idly by during the intermissions of the 360-meter broadcast, the operator may tune in another broadcasting station. A greater variety of concerts is available at the touch of the tuning knobs. One is no longer compelled to stay on the 360-meter wave.

This receiver is easy to build and operate. Besides the necessary tube controls, there are but three others: the antenna series-condenser, the tickler coupling and the inductance switch. The circuit is the familiar plate feed-back circuit used extensively in the United States Navy. It is as efficient as

—and certainly more flexible than—the variometer type of regenerative circuit. It is simpler in operation and construction. The antenna tuning inductance is wound on a cardboard tube 4 inches in diameter and 9 inches long. Only 7 inches of the tube is wound with one even layer of No. 24 single cotton-covered wire. The winding is tapped at the 20th tap, and every 10th tap thereafter until the 80th. Then use taps every 40th turn until used. The first seventy turns will provide ample tuning for waves up to 600 meters. The winding is then given a coat of white or brown shellac and left to dry. This will tend to hold the wires firmly from becoming undone, as, in some cases, this will happen. The next 2 inches of the tube, which is left unwound, will be used for the tickler-coupling winding. This winding is a continuation of the main inductance and consists of 50 turns of No. 22 single cotton-covered wire wound in two sections of 25 turns

It Is "Broadcast"

IT is incorrect to say that a message was "broadcast." Hereafter the word will not appear in the columns of RADIO WORLD. We have ascertained, to our final satisfaction, that the past participle of "broadcast," like "forecast," is the same as the infinitive form. Therefore, the program "was broadcast from XZZZ" will be our—and the only correct—way of expressing it.

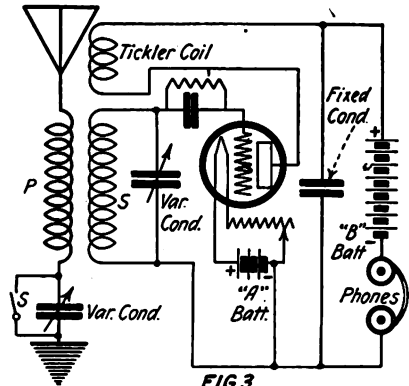


FIG. 3

Schematic diagram to indicate how the set should be wired in order to obtain regeneration. Suggested by G. W. May. Drawn by S. Newman.

each with a separation of $\frac{3}{4}$ of an inch between sections. This space will serve for the tickler-shaft bearing.

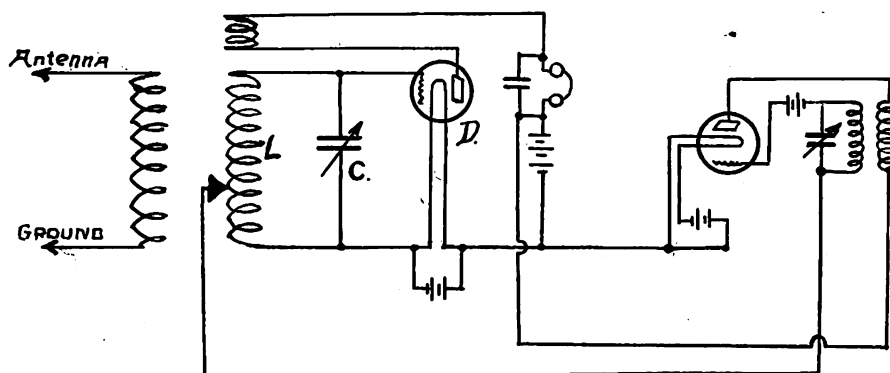
The tickler comes next. It consists of a tube 3 inches in diameter and $1\frac{1}{2}$ inches long. It is fitted with a brass rod, which serves as a shaft for its rotation when placed inside the main inductance-coil. The winding consists of 2 sections with a separation of the sections $\frac{3}{4}$ of an inch wide. This tickler winding is coupled to the winding just described and serves to feed back the energy from the plate circuit.

The next piece of apparatus required is a variable condenser, .001 mfd. It is used in the antenna circuit and is valuable for fine tuning impossible with the inductance taps alone. The only equipment needed now is the usual tube apparatus.

Generally when using the regenerative or tickler-coil method, the radiophone station denotes its presence by a whistling sound as the tuner is varied. By moving the tuner back and forth over the entire range of wave lengths, whistling sounds may be detected at certain points. Then the tuner is finally adjusted so as to get in between these whistling points or sounds, where there is a silent zone. It is in this zone that the radiophone music or talk is heard. At other times, these whistling sounds are due to continuous waves or undamped wave-transmitters which, like the radiophone, make use of the same kind of waves and, therefore, have the same characteristics. All regenerative sets are delicate to operate for the regenerative effect and give rise to all kinds of noises. Furthermore it is necessary to use metallic shields between the operator and component parts of the regenerative set, since the capacity of the body of the operator affects the delicate adjustments.

Tested Invention of Major Armstrong Amplifies Set 100,000 Times

By John Kent



As will be seen from the schematic diagram Major Armstrong's unusual result is obtained by the addition of a second tube to the detector tube and connecting this second tube so that it acts as an automatic switch automatically cutting in and out a few turns of wire on the secondary inductance. The ordinary Armstrong regenerative circuit is used as the basis for the new circuit, the plate circuit of the "switch tube" being connected to the plate circuit of the detector tube through suitable inductance and capacity. The grid of the second tube is inductively coupled to its plate circuit. In this way the variation is introduced into the positive resistance of the tuned circuit. This is done by means of an oscillating tube (the tube at the extreme right), the grid circuit of which is connected through the tuned circuit L-C of the amplifying tube D. L is inductance and C the capacity. Drawn by John Kent.

BEFORE a crowd of radio engineers, radio amateurs, and plain radio fans that filled to overflowing the auditorium set aside for the regular meeting of the Institute of Radio Engineers in the Engineering Societies Building, Wednesday evening, June 7, Major Edwin H. Armstrong divulged for the first time his second revolutionizing contribution to radio science—the Armstrong super-regenerative circuit.

With a directness and simplicity that appealed to those in the audience who were not learned engineers, Major Armstrong commenced at the lowest rung of his ladder of research and carried the work, step by step, to the final result after which he demonstrated the circuit by comparison with the standard regenerative feed-back hook-up. Using a 3-foot, 12-strand loop aerial pointed for WJZ, Newark, N. J., the young inventor demonstrated his invention which, under test, has proved that it can amplify radio impulses 100,000 or more times. Signals which could barely be heard with a two-stage regenerative set, filled the room and reverberated back and forth when his new two-tube circuit was substituted. At the close, the audience showed its appreciation of the marvelous work by prolonged applause that left no doubt of their admiration for its inventor.

During the course of his explanation, Major Armstrong described in great detail the three principal methods

which he has devised to accomplish superregeneration. After describing the struggles of amateur experimenters with regenerative circuits, during which they had attempted to find a way to prevent the vacuum tube from sliding over into the oscillating state as the regenerative coupling was increased Major Armstrong stated that unlimited regeneration could be accomplished if these oscillations could be prevented. While working on the problem himself he had resolved the problem to one of varying the positive resistance of the circuit while holding the negative resistance constant. Other methods of accomplishing the same result could be secured by varying the negative resistance as the positive resistance was held constant or by varying both negative and positive resistance in regular cycles but with the average negative resistance always greater than the average positive resistance. The accompanying schematic diagram embodies the condition of varying the positive resistance while holding the negative constant.

Heretofore, the most powerful amplifier had an increasing power of 5,000. With Major Armstrong's invention in use, an amateur with an or-

dinary receiving-set will be able to pick up the faintest broadcasting of Europe or the Orient. Major Armstrong calls his invention a "super-regenerative circuit"—perhaps the most important addition yet made in radio equipment. He outlines its possibilities in his own words:

"A brief way to describe the super-regenerative circuit," says Major Armstrong, "is that one vacuum tube is made to do the work formerly done by three. It has been shown, for several years, that the limit of amplification is reached when the negative charge in the tube approaches the positive. In experimenting, I found that it is possible to increase the negative charge temporarily, for about one-twenty thousandths of a second, far above the positive, and still keep the average down. It is the possibility of increase which permits the enormous amplification which I have demonstrated and enables me to eliminate two tubes from the circuit.

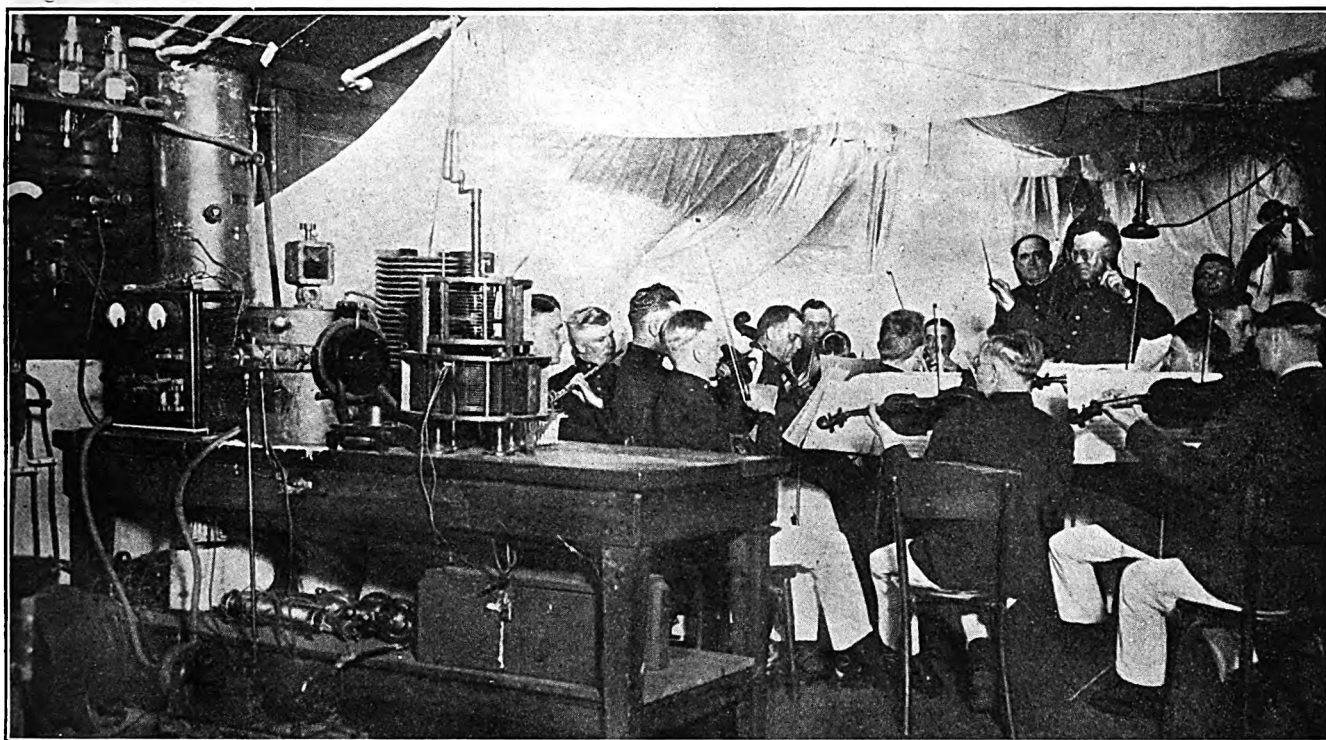
"Another practical result of this circuit will be the ability to detect wavelengths under two hundred meters with ordinary amateur-sets. In the past, short wave-lengths were undistinguishable for small sets. Now that the range under two hundred meters is available for the broadcasting stations, the cost of operating will be lessened. To illustrate the difference between a receiving set equipped with the super-regenerative circuit and the ordinary set, I have found that the signal which can just be heard with a simple regenerative-circuit, at the most critical zero point, can be heard all over the room with the super-regenerative circuit."

The new instrument also enables the amateur to get along well without an outside aerial without spending any more for his equipment than he spends now for an outfit with the aerial. The outfit with the super-regenerative circuit may be manufactured for the same price as equipment requiring the cumbersome outside aerial. Receiving outfits with outside aerials have been in use for some time, but they have been too costly for many amateurs.

Major Armstrong's invention is a very important step in the development of radio. He has a number of inventions to his credit, particularly the radio-audion and the superheterodyne. Major Armstrong experiments in the Hartley Research Laboratories, Columbia University, New York.

Invention is the most constructive force in our economic life.—Miller Reese Hutchison.

Two Millions Heard this Band Play



(C. Underwood & Underwood, N. Y.)

Have you heard the United States Marine Band play for radio fans? It not, listen in any Wednesday night. This famous musical organization plays by permission of Edwin Denby, Secretary of the United States Navy. Anacostia Naval Station does the modulating on 412 meters, between the hours of 8:30 and 9:30 p. m. The concerts are directed by Captain William M. Santelman, and continue for over an hour. The illustration shows the band section of the interior of the United States Broadcasting Station at Anacostia, D. C.

Repairing Cranks in Hard Rubber Storage Battery Jars

By W. S. Standiford

STORAGE batteries are in extensive use for both automobile and radio work, the best ones being enclosed in hard-rubber containers. • It frequently happens that such a jar gets cracked, is rendered useless, and must be thrown away. The writer has found out that such a course is not necessary, as a repair job may be done which will prove satisfactory.

Proceed as follows: Take a three-cornered triangular-shaped file, and file the crack to a V-shape, making the widest opening face towards the outside surface. Next, get an old-style wax Edison cylinder phonograph-record and cut a stick, lengthwise, out of it. Take your hot soldering iron, place the box on its side, and, holding the material over the crack, run it into the fracture. The hot iron will operate nicely and permit neat work. When cool, the break is repaired.

Should one of these old-style records be unobtainable, a filling mixture

can be made by melting together a compound composed of 50 per cent paraffine wax, 25 per cent bees-wax, 100 per cent rosin, and 5 per cent sulphur. The above will give good insulating and sealing results and stand acids. If a person does not care to mix the formula and desires to use something simpler, some of the automobile tire cements for patches as well as a ready-prepared dough, sold in cans, will do very nicely. It is best, in all cases, to widen the crack at its top so as to get a lot of cement in; as it holds better while the battery is in use.

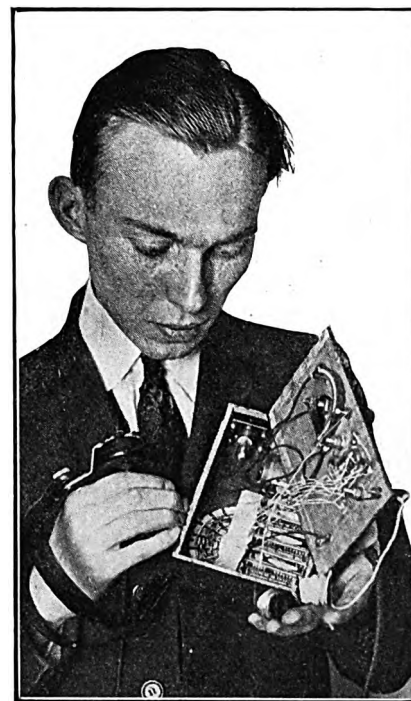
Radiolets

With the radiophone in receptive mood, all the family quarrels may be enjoyed by the neighbors without putting ears to the walls or opening the windows.—
"Topics of the Day."

* * *

What we may expect to hear next: "I am returning your coin. The air is busy," or perhaps, "Say, operator, you gave me the wrong wave length."

Vacuum-Tube Pocket Set Wins First Prize



(C. Kadel & Herbert)

Sterling S. Sears has won first prize at the New York Radio Show for the smallest vacuum tube set. It has a range of 75 miles. The set is about as large as a book and weighs less than half a pound.

Photograph Sent by Radio from Italy to United States in 40 Minutes!

"The World," of New York, in its issue dated Sunday, June 11, offers evidence of an extraordinary feat of modern science—the transmission by wireless telegraphy of a photograph from Rome, Italy, to Bar Harbor, Me., and its reproduction in New York. RADIO WORLD is permitted to republish in part this article through the courtesy of "The World" and Mr. Arthur Benington, its author.

THE process by which this "miracle" was performed is the invention of Dr. Arthur Korn, professor of electrophysics at the Berlin High School of Technology. Tests of it that have been under way between his laboratory at Centecello, a suburb of Rome, and the United States Navy Radio Station at Otter Cliffs, Bar Harbor, were announced in *The World* of May 6, and now *The World* reproduces a photograph actually sent in the same way and over the same route.

When this photograph was "filed," at Rome no one in America had ever seen it. Forty minutes later it had been picked out of the ether on the Maine coast by Chief Radioman Edmund H. Hansen, U. S. N. From Bar Harbor to New York it had to be transmitted by mail, but from Rome to New York less than twenty-four hours elapsed.

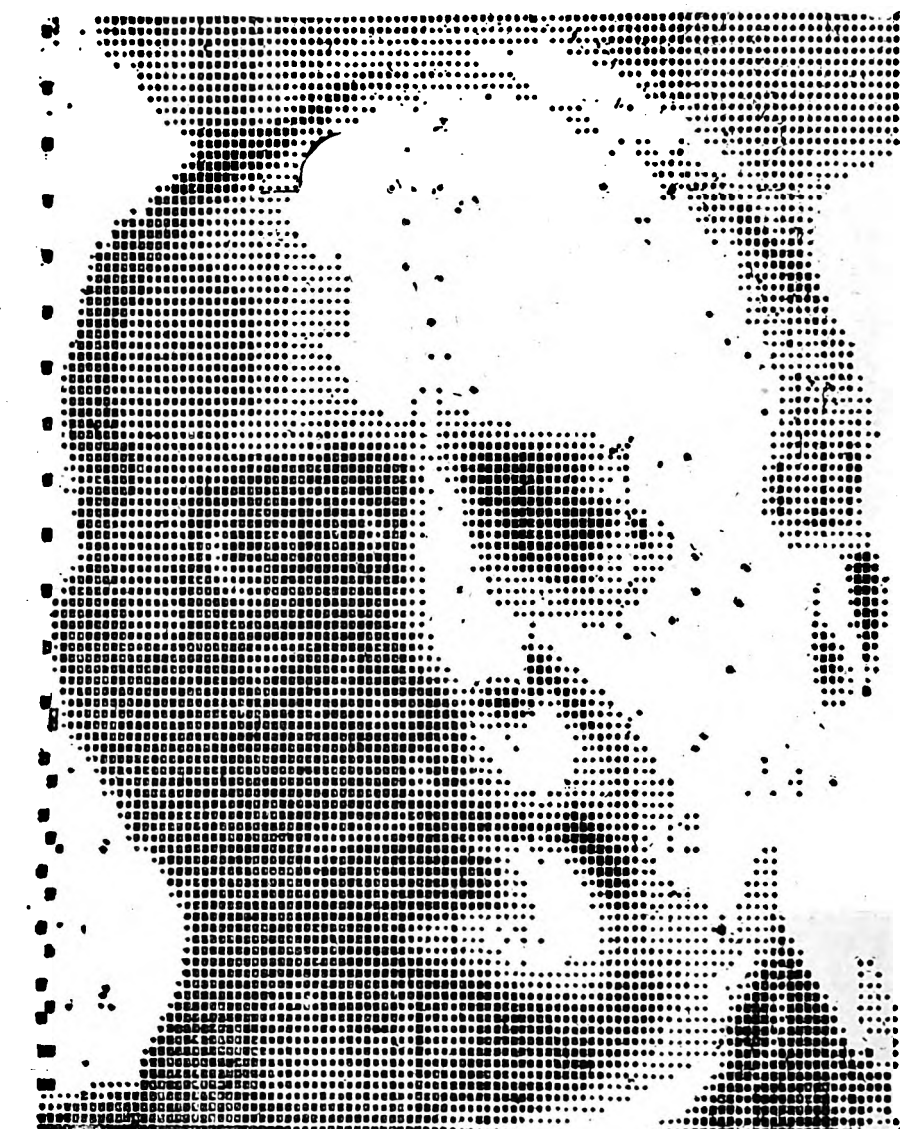
The result of the experiment is far from perfect, but it points the way to an achievement that seems now to be in the near future. Over shorter distances and under more favorable conditions pictures have been transmitted and reproduced with surprising clarity of detail. The picture produced herewith is evidence that the basic method is sound and that with refinements of the mechanical processes and certain elaborations of their use the time soon may come when pictorial records of events will be available as speedily and as accurately as descriptions of them already are.

The larger of the pictures appearing on this page was photographed directly from the "translation" made at Bar Harbor by Chief Radioman Hansen of the message sent from Rome. The original measured 7 by 9½ inches, so that the reproduction here was reduced not quite one-third. It portrays vividly the method used. The smaller picture is this same photograph of the "translation" reduced to standard one column size.

Two years ago, *The World* amazed its readers, and especially the great scientists, by transmitting photographs by telegraph between New York and St. Louis. This was made possible by its use of the apparatus invented by Edouard Belin, the French electrical engineer, whom it brought from Paris just to make this demonstration. Last fall it again astonished its readers by printing autographic reproductions of messages signed by Premier Briand of France and Gen. Pershing sent by wireless from Paris, also by the Belin method.

This latest feat, however, is by an entirely new and distinct process. Dr. Korn had invented and carried to some degree of perfection a method of transmitting photographs by telegraph before the war. Terms had been arranged with several countries when the outbreak of hostilities brought these to an end.

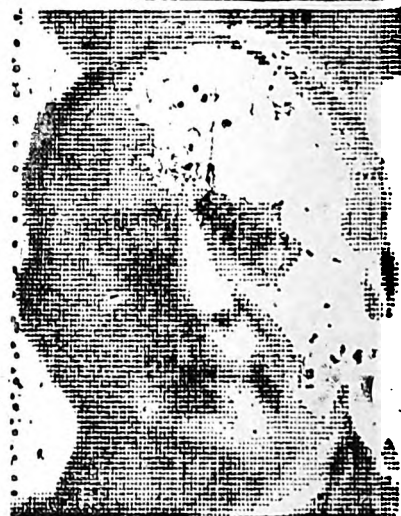
When the war was over, Dr. Korn found it impossible to get the financial backing he needed for his final experiments. He went to Italy and interested some wealthy men in his invention, with the result that it was



Photograph sent by radio from Rome, Italy, to Bar Harbor, Maine, reduced from the print in the New York "World." The large reduction is less than one-third of the original radioed copy. At the lower right is a reduction made to the standard newspaper one-column size. This is one of the most remarkable radio achievements of the day. It is only the crude beginning of what may be expected in this still undeveloped science. There are only two sets of Dr. Korn's apparatus in existence. One in Germany, the sender; the other in his laboratory in Centocelle, near Rome. The receiving, or decoding, instrument is in America.

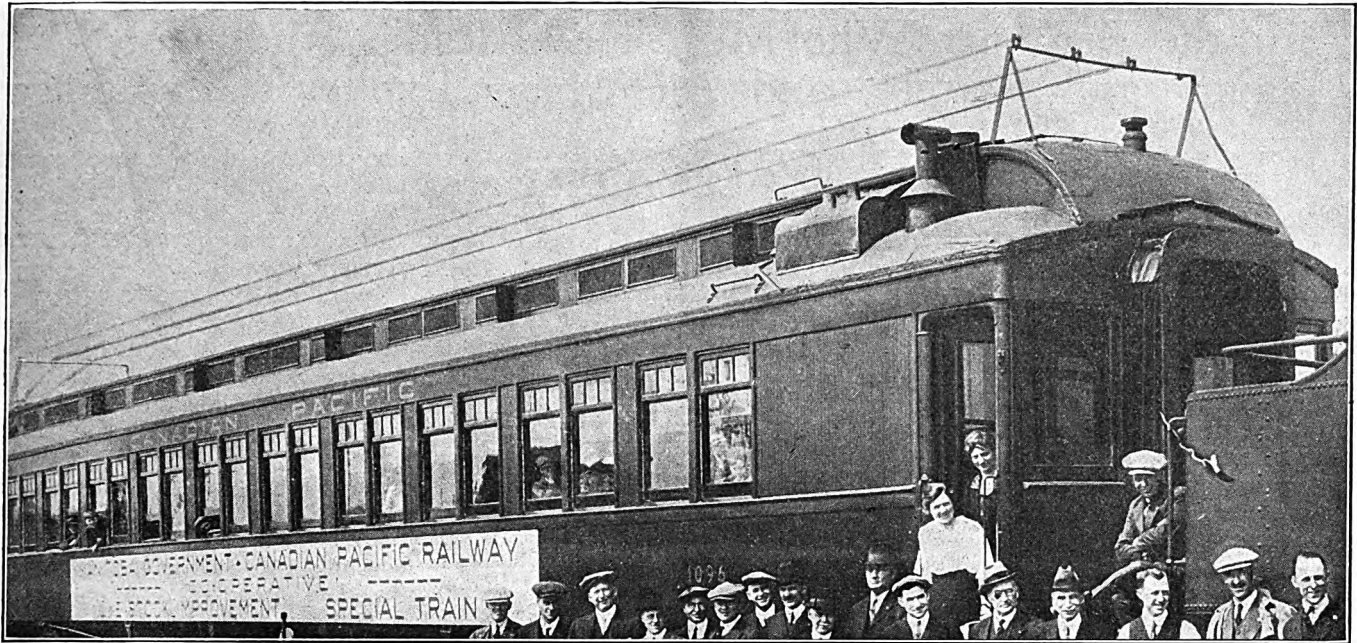
completed in Rome and a company organized. This is called the *Sindacato Italiano Invenzioni e Scoperte* (Italian Association for Inventions and Discoveries) and has acquired the patents taken out by Dr. Korn. Commendatore Francesco Pascale, an Italian Senator, is President and General Manager.

It was through Commendatore Pascale that *The World* was enabled to secure the picture reproduced herewith. Much more than this alone was required, however, for



the receiving machine now at Otter Cliffs was there by reason of tests being made by the Italian Admiralty with the co-operation of the United States Navy Department. Official permission was necessary from these two and last week it was granted.

Canada's First Radio-Equipped Train



The Canadian Pacific is the first railway in Canada to install radio on its trains. Travelers on the livestock train of seventeen cars now touring the Province of Manitoba will receive from Winnipeg headquarters concerts and all important news of the world as they proceed on their itinerary, even to the remotest rural places. Two Marconi representatives and a radio machine accompany the train to insure successful working of the apparatus. The livestock-improvement train is equipped and maintained by the Canadian Pacific Railway. The project is backed by the Dominion Department of Agriculture, the Agricultural College, the Livestock Exchange, the packing companies and the Cattle Breeders' Association of Manitoba. It will tour the Western Provinces in the interests of better farming and particularly to encourage the breeding of higher-grade and more profitable livestock. The illustration shows part of train with the radio apparatus at both ends of a coach.

Hook-ups *By Albert P. Taylor*

WERE you tuned in when John C. Freund, editor of "Musical America," gave that great talk of his from WJZ? Said a lot of homely things, didn't he? But it hit the nail squarely on the head. Maybe there is some music "made in America" that we don't care to blow about; if there is, it hasn't been riding on a 360-meter wave. We noticed what he said about his age—eighty, and about "music in the home." Recommended radio as a means of bringing it there (the music, not the age.) A man of his years has sure seen some new things spring up. Well, we think there will be a lot to see yet in the radio field. Wish somebody would show a picture of the youngest and oldest tuning in. Age don't count in this business.

Uncle Sam is a few meters ahead of the fans across the big pond. It isn't all their fault, though. Most of the governments over there haven't given them the leeway, so people there didn't have such programs handed out to them every day, and most all day, like we do. Reckon it will be different soon because we sent some fellows over there to hold a confab with them. That gave us a fine chance to tell them some things about the doings in wireless on this side. Most of us don't realize where we have jumped to, so suddenly, in radio. Let's keep there, too.

We've got to decide on a language to use when those big wireless-telephony stations swing into the ether, for they will be located in several different countries. If they each talk their home dialect, there'll be some folks won't understand a thing, no matter who's talking—Spaniard, Italian, French, or Englishman. We hear some fans are trying to learn Esperanto. If they use that the whole crowd will have to pitch in and study. There's a few of us understand English (fairly well), probably more than would understand any of the other languages. Now somebody's got to learn a new brogue, so why not let the other fellows do it?

A fan in our New York State wrote from his farm to a farm journal about his experience listening in to WJZ and KDKA. He says he makes use of the crop reports and the weather jokes. Always gets his time correct, too, even if he does have to sit up late for a daylight-saving farmer to get it. He tuned in to hear the Shady Avenue Church services, though he isn't much on church, he writes. Thought that was fine! Enjoyed the sermon as well as the music.

* * *

We got a phonograph with a lot of spunk. Rigged up a contraction so as we could use the thing as a loud speaker. At first it worked fine. That was "Bedtime Stories." Then they put on some records and the blame thing struck! Won't receive second-hand phonograph stuff. 'Spose that's temperament.

* * *

Some trains have added receiving sets to make the passengers forget their troubles. Where the road-bed is rough, or the fat man in the upper ten snores so loud you can't sleep, just tune in 'he set in your car and turn madness into joy. Again it may be that lady behind you "loud speaking" her mind to the small boy. When you get tired of it, amble up to the set and tune in!

* * *

Station WWI will give the autobiography of the "flivver." Yes sir, Henry Ford is going to reveal the secrets in the darkest closets of the popular heroins. Really the Ford is the "crystal set" of the automobile world. Now it would be a nice thing for every owner of a "Lizzie" to drive her up to the window, so she can listen to her master's voice.

* * *

Crystal D. Tector, in her interesting department in RADIO WORLD, made an observation that startled us. Is it possible that pipes and cigarettes are to fade out when any polite receiving sets are around?

Radio Will Carry Wisdom to the World's Remotest Ends.—Tesla

The Radio Primer

For the Beginner Who Must Have Radio Rudiments, Put Plainly and Tersely, and All Terms Explicitly Explained

The Beginner's Catechism

By Edward Linwood

WHAT are the essential features of construction of the audio-frequency amplifying transformer?

The audio-frequency amplifying transformer consists of an iron core around which are wound several thousand turns of fine insulated wire. The windings are in two parts, the primary and secondary.

* * *

What is meant by the terms, Primary and Secondary?

These words are used to designate the two windings of the transformers. The primary winding is the winding into which the current is fed. The secondary winding is the winding from which the transformed current is taken.

* * *

How is the iron core made?

The core is made up of a large number of thin sheets of a special iron arranged in a square or rectangle, thus forming a complete path for the magnetic force which is produced in the iron when the primary of the transformer is connected to a source of electricity.

* * *

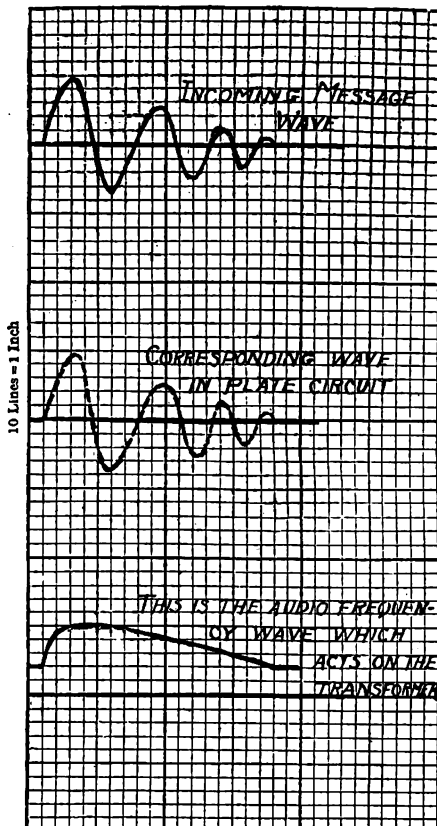
What makes necessary the use of thin sheets? Why cannot iron rods of the correct size be used?

Very small currents which pass around and around in the iron, heating the iron and causing a loss in efficiency, are present when a solid core is used. Particularly if the iron contains impurities, these eddy currents, so called, must be reckoned with. By making the core of thin laminations the effect of the eddy currents is greatly reduced. When it is considered that the loss in energy from eddy currents increases with the square of the frequency, and that, in radio work, the frequency often rises to 3000 a second or more, the desirability of keeping the eddy currents within limits is easily appreciated.

* * *

How are the windings proportioned between primary and secondary?

The "ratio of transformation," as the relative proportion of turns is called, varies in audio-frequency transformers from 2 to 1 up to as high as 10 to 1, meaning that there are up to



Graph showing the three curves, which indicate how the incoming wave acts on the transformer. The first is the incoming wave. The second is the wave on the plate circuit. The third is the wave acting on the transformer. Suggested and drawn by Edward Linwood

ten times as many turns of wire on the secondary as on the primary.

* * *

What determines the proper ratio to use?

The design and operating characteristics of the vacuum tubes in use. To be of the highest efficiency as an inductive coupling between amplifier tubes, the primary and secondary windings should take into consideration the

The Radio Primer has been published regularly in RADIO WORLD since issue No. 1, and will be a regular department in order to instruct and aid the many thousands of amateurs who are joining the ranks of radio enthusiasts every week.

impedance of the two tubes connected into the circuit.

* * *

What is the function of these transformers?

To change the audio-frequency variations in the plate circuit of the detector tube, for instance, into similar but greater variations in the grid circuit of the first amplifier tube. As a potential on the grid determines the strength of the signals heard by means of phones in the plate circuit, the transformers make it possible to strengthen greatly these signals by increasing or boosting the potential impressed from the plate circuit of one tube onto the grid circuit of the next.

* * *

In building a set at home is it advisable to attempt to construct one's own transformers?

No, because of the many uncertainties which must enter into such designs. You have no way of knowing the permeability of the iron sheets. You are not certain that the core is correctly proportioned and the best methods of interconnecting the coils of primary and secondary are always in doubt. The average amateur will have sufficient trouble in maintaining a cascade amplifier set in perfect operation with purchased transformers, without adding to his woes with poorly assembled, inefficiently designed apparatus.

* * *

What is the principal trouble encountered in the operation of amplifiers?

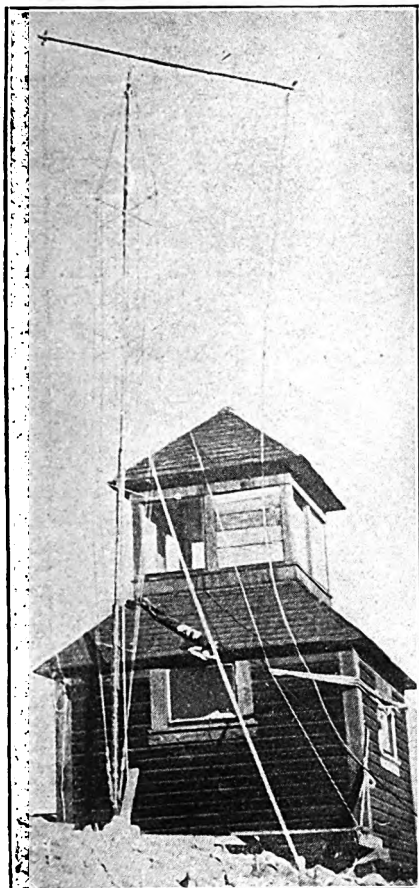
Howling between the stages. If the transformers are placed too close together the magnetic leakage, caused by lines of force escaping from the core into the air, passes from one transformer into the next and destroys the electrical balance. As a result the circuits are placed in a state of unbalance resulting in a series of screams and screeches in the phones.

* * *

Is there any way to prevent this trouble?

Howling from magnetic leakage can be prevented by spacing the transformers four or more inches apart and at right angles to each other. The same effect is gained by enclosing each transformer in a complete covering of metal. When this is done the vagrant lines of force pass into the metal which should be grounded, rather than into the iron core of the nearby transformer.

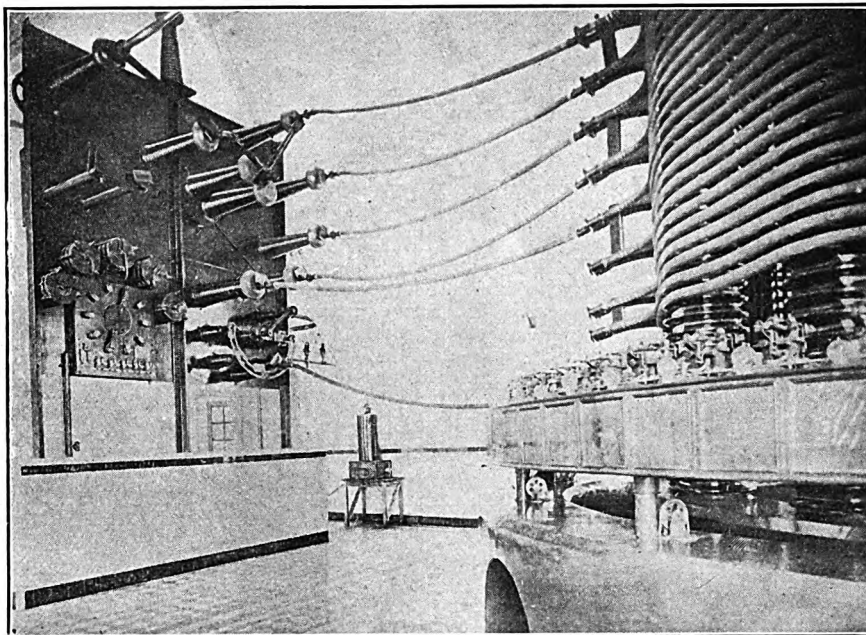
U.S. Radio and Look-out Station, 11,250 ft. above Sea Level



(E. C. Underwood & Underwood, N. Y.)

It is situated on Mt. Hood, Oregon, to locate forest fires.

Interior of the World's Largest Radio Station



(C. Kadel & Herbert News Service.)

The powerful, well-equipped station at Lafayette, near Bordeaux, France, built by the United States Navy to facilitate America's part in the World War and since sold to France for trans-Atlantic communication. In *Radio World*, May 13, No. 7, an illustration was shown of the towers and building where messages are transmitted 4,000 miles. The above illustration is an interior view of the large inductance coils and various high-tension insulators whereby messages must be sent through in order that they may be conveyed to the huge antennas strung from the mighty towers. This station is now challenged for first place by the commercial station at Port Jefferson, Long Island, New York, which, if it is not now more powerful, will be when additional units are added. Radio waves are transmitted from the Bordeaux station on a wave length of 23,000 meters, approximately fourteen miles. Radio communication is now established between this station and that of the Radio Corporation station at Port Jefferson, Long Island, New York.

Radio World's Revised Radio Dictionary

Battery—A much abused word, being often used incorrectly for "cell." Careful distinction should be made between them. A battery consists of two or more cells joined together so as to form a single unit.

B. Battery—A high-potential (high-voltage) battery connected to the plate of a vacuum tube.

Battery (storage)—A battery which may be charged and discharged repeatedly. Such batteries are charged by connecting them to a source of direct current.

Battery Charger—Usually a device which changes alternating current to direct current, so that it may be used to charge a storage battery. Frequently referred to as a rectifier.

Bakelite—Trade name for an insulating material used in the form of panels, plates, tubes, and rods.

Ball Type Variometer—A variometer, the coils of which are wound upon a spherical form.

Bobbins—The little spools in the telephone receiver that hold the fine wire on which the diaphragm rests.

Bulb—Vacuum-tube detectors and amplifiers are often called "bulbs."

Brush Discharge—The brushlike appearance of luminous rays diverging from a pointed electrified body.

Broadcasting—The sending of intelligence either by radiotelegraphy or radiotelephony, from some central point for the benefit of a number of receiving stations located within the range of the broadcasting station. Also, a radiotelephone station used to send forth music and other entertainment for the public.

Capacity—Extent of power to contain or hold. Electrical condensers are able to hold a certain amount of electric current in the form of electric static charges. The changing of the capacity of a wireless circuit always brings about a change in the wave length. The unit of electrical capacity is the farad; but the farad being too large for practical radio work, the microfarad is used. The abbreviation is generally used as MFD., meaning microfarad.

Cascade Amplification—When several vacuum tubes are employed, which refers to high amplification, sounds or waves are amplified as they pass on from one tube to another many hundreds of times. Thus we may speak of a two-step amplifier as a cascade.

Change-Over Switch—A switch used to disconnect and connect the transmitting set from the receiving set. In other words, a switch with two poles and a double throw. The central points of the switch are connected with the aerial and

the ground. When the switch is thrown in one direction, the receiving instruments are connected to the aerial and ground. When it is thrown in the opposite direction, the transmitting instruments are connected to the aerial and the ground.

Compass Radio—A radio receiver by which the direction of a sending station may be determined. The aerial, which is in the form of a large coil, or "loop," is turned on its axis until the maximum energy is received.

Condenser—Two or more conductors separated by an insulating substance. A condenser represents electrical capacity. An electric current may be stored in a condenser.

Continuous Wave—A wireless wave that does not "damp" or fade out. All waves are of the same size. Continuous waves are usually referred to as C.W.

Coulomb—The unit of electrical quantity. The amount of electrical energy that passes a given point in a circuit when a current of one ampere flows for one second.

Coil (Spider Web)—An inductance coil used in radio, wound flat like a spider web.

Coil (Tickler Special)—Coil used in radio receiving circuits of the regenerative sets.

Radiograms

THE DEPARTMENT OF AGRICULTURE WILL BROADCAST weather, crop and market reports daily from Arlington and Great Lakes wireless stations of the Navy Department. W. A. Wheeler, in charge of the work, says: "This makes possible the receipt of agricultural reports by radio through virtually the entire United States, and is the most important step of its kind in the radio world."

THE SAME INSURANCE IS NOW PLACED ON RADIO AS ON ELECTRIC LIGHTING. Contrary to prevalent opinion that the installation of radio increases the rate of insurance, the Suburban Fire Insurance Exchange, maintained by the leading fire insurance companies, announces that radio installation is considered in the same class as electric wiring which has no effect on insurance rates in most states.

IN CANADA, THE AMATEUR IS TAXED \$1 for all experimental radio sets. Over 400 licenses have been granted by the government.

A BROADCASTING STATION ERECTED AND MAINTAINED BY POPULAR SUBSCRIPTION is planned by the University of South Carolina, Columbia, S. C. It is expected to raise \$12,000 in \$1 donations.

SOVIET RUSSIA WILL SOON HAVE A RADIO STATION CAPABLE OF TRANS-ATLANTIC SERVICE. This news is sent out by the Posts and Telegraph Department. The station, to be erected at Bogorodsk, near Moscow, will be one of the most powerful in the world. Its towers will be 900 feet high, 300 feet higher than the famous towers at Nauen, Germany. The power will be 500 kilowatts. Russia now has thirty-eight sending stations and 290 receiving stations.

WITH A POPULATION OF ONLY 120, Tristan da Cunha, the British island in the middle of the South Atlantic, will have a radio station. Its population is mostly descendants of Napoleon's St. Helena guards.

THE HOLY BIBLE WILL BE BROADCAST by the Westinghouse Company from Newark, N. J., (WJZ) as a part of its daily broadcasting service. This will be done to increase the interest in scriptural literature.

SUCCESSFUL TESTS HAVE BEEN MADE WITH RADIO FOR GUIDING AIRPLANES IN FOGGY WEATHER at Croydon, the aerodrome terminal in London. An operator on the ground is able to tell the pilot of the airplane into which section of the aerodrome he can make a safe landing and the exact moment when he may descend.

OVER 600,000 RECEIVING STATIONS IN THE UNITED STATES! This is the estimate of experts. The output of manufacturers only marks the limit to which receiving stations will go.

THERE ARE TEN TRANSOCEANIC STATIONS OPERATING IN THIS COUNTRY. And American ships to the number of 2,783 are carrying radio and are listed as ship stations—nearly four times the number of ships listed as radio carriers before the World War.

TO MAKE BRITISH BROADCASTING SELF-SUPPORTING, the British Government believes that one special agency should be licensed to broadcast, and that, through the post office, all receiving stations should be licensed. This is declared necessary to insure a high-class program of entertainment.

IT IS AMAZING TO REALIZE THAT 305 BROADCASTING STATIONS licensed by the United States Department of Commerce are now in full operation. This should keep all radiophone owners up to the minute on all the latest news of the world.

"SPIRITISTS MAY BE HIGH FREQUENCY RADIO RECEIVERS AND NOT KNOW IT," asserts Professor William C. Ballard, professor of electrical engineering, in charge of the department of electrical communications of Cornell University. Radio, heat, light waves, and the waves of the X-ray he explains, are all of the same kind—electro-magnetic—but

Radio Set in Safety-Razor Box



(C. Kadel & Herbert News Service)

Many attempts have been made to build a miniature radio set that will actually work, but few have operated successfully. Sidney Kasindorf (in photograph) after a great deal of experimenting, has made a radio set in a safety-razor box that is unusually unique. From his home in the Bronx, N. Y., he can hear WJZ, Newark, distinctly. His set, which is very small, consists of a variable condenser, tuning coil and a crystal detector. A buzzer test adds to the efficiency of this boy's very interesting piece of workmanship. This would enable a person to carry this miniature receiving set most anywhere, and, with the proper equipment—such as aerial, ground and head phones—messages should be received.

in between the heat and radio waves is an unexplored range of frequency.

NEW JERSEY CLAIMS THAT HER PEOPLE HAVE TAKEN TO RADIO more completely than the people of any other State. Hundreds of New Jersey public-school children are actively engaged in experiments.

IN THE FUTURE PATRIOTIC EXERCISES IN PUBLIC SCHOOLS WILL BE ARRANGED BY RADIO. Amplifiers will be erected in assembly rooms and messages of the day broadcast to half a million pupils at one time. The day is not far off when the President of the United States, sitting in the White House, may send words of inspiration to the school children of America on special occasions.

FROM ALL QUARTERS INHABITED BY RADIO FANS come reports of much confusion caused by broadcasting stations that fail to sign their call letters more than once or twice during an evening's entertainment. The listeners-in are curious to know to whom they are indebted for their diversion. They have no means of finding out unless they should be on hand the exact moment the sender decides to sign.

IN SOME QUARTERS IT HAS BEEN FELT THAT RADIO WAS INVADING THE FIELD OF THE NEWSPAPERS. Statistics prove the opposite. The circulation of metropolitan newspapers has generally increased since radio news has been receivable.

A RADIO HONEYMOON IS BETTER THAN NONE. When Mr. and Mrs. Sherman Holt recently started for Europe, from New York, on their honeymoon trip, Mr. Holt, through a business meeting in Philadelphia, missed the "George Washington," which put to sea with his bride aboard. A radio message was sent to Mrs. Holt to relieve her mind. Meanwhile, Mr. Holt has taken a radio equipped room at the McAlpin Hotel, to keep in communication with his wife as long as possible.

Radio and the Woman *By Crystal D. Tector*

ONE New York radio merchant is taking time by the forelock and is building for the period when women will become potent factors as purchasers of radio equipment. He has placed an energetic and attractive young sales-woman in his radio department. He avers that the young woman in question is just as good a salesman as any of the males in his employ, and he believes that, eventually, when women will buy radio goods as they now buy butter or voile, he will be ready to take care of the new angle in trade. Which recalls an amusing incident told by the same business man. A woman came up to his radio counter and asked if she could buy a receiving set that would play all the leading jazz music. Her intentions were good enough and her interest in radio unmistakable, but somehow, she seemed to get terribly mixed in distinguishing between phonograph records and head sets.

* * *

Will it be easier, hereafter, hubby to occasionally cut out one of his week-end excursions to wife and the kiddies in places far away from his center of business activities? That is to say, will the installation of radio sets in summer homes make solitary waiting and watching a little less irksome? I have just heard the story of a young married woman who has taken a bungalow at Rye Beach, N. Y., and whose first inquiry was not whether the plumbing was all right, or whether there were wasps in the eave. She wanted to know if there was an antenna connected with the establishment; and when she found there was, she signed the lease and now declares she isn't going to be lonesome no matter how late friend husband remains in town.

* * *

One enterprising Catskill Hotel proprietor is advertising the fact that he has equipped his ball-room with an expensive radio-outfit and that his guests may now enjoy the new pastime and science without any extra items on their bills.

* * *

You will remember that, some weeks ago, Ed Wynn, the man with the funny hat and face, radioized a part of his performance for the benefit of the general public. A young girl in the company, whose chief claim to fame is that she looks very well in an ensemble, asked Mr. Wynn if her name appeared in the cast of those who supported him in his broadcasting operations. When Mr. Wynn patiently explained to the young woman that he was the star of the aggregation she forthwith handed in her resignation. There is no particular moral to this story except that her resignation was accepted faster than it was tendered.

* * *

A high-school girl of Holyoke, Mass., is said to have received messages from a point farther off than have been covered by any other radio enthusiast in her town. She is now trying to reach across to the Pacific without the aid of relays. Can she do it? Those who know the resourcefulness and skill of this young girl declare that she will do it, if it can be done by anybody.

* * *

The daily papers occasionally print jokes aimed at the inaccuracy or utter ignorance of women on radio subjects. These jokes will, of course, have their run along with the mother-in-law, the flivver, and Conan Doyle's spiritistic near witticisms. But it looks just now as if Madame would soon show that her mental equipment is quite sufficient to encompass the difficulties of this wonderful radio game. Cartoonists, too, will also have their little fling at woman's presumption in believing that she can become mistress of a different science; but then cartoonists must have their fling and they might



(C. Fotograms, N. Y.)

Mrs. Oliver Harriman, president of the Camp Fire Girls, broadcasting a message to fathers and mothers telling how girls are developed by joining the organization of which she is the leader. Mrs. Harriman is speaking into an ordinary telephone with a horn, shaped of paper, attached to the mouthpiece. This helps to carry the minutest shades of her voice into the microphone of the transmitter, enabling perfect modulation of speech to be received.

just as well direct the slings and arrows of outrageous fortune at our weak flesh as at anything else that may catch their gaze.

* * *

Did you see in the columns of a Sunday supplement, recently, the picture of a baby carriage, a baby, a receiving set, and nothing else in the world that had anything to do with radio? It was a perfectly cute picture, but the mere fact that the baby couldn't possibly hear anything through the receiver as arranged on its little head evidently didn't bother the photographer at all.

Broadcasting, Old Verb

A London literary weekly says "broadcasting" is "a new word added to the language by wireless telephony," says a correspondent of the New York "World." Such a periodical should rather have referred with pleasure to the fact that the good English verb "to broadcast" has found apt employment for many years.

There is a popular hymn which thousands of Lancashire people sing at Whitsuntide, whose first verse begins, "Sow in the morn thy seed," and ends with "Broadcast it o'er the land." Reference to the Thesaurus confirms the fact that broadcast was already in the language, and suggests that in its place we might easily have been afflicted with one of its synonyms. "Widespreading" would have been as good.

SUBSCRIPTION BLANK

RADIO WORLD

RADIO WORLD CO.,

1493 Broadway, New York City.

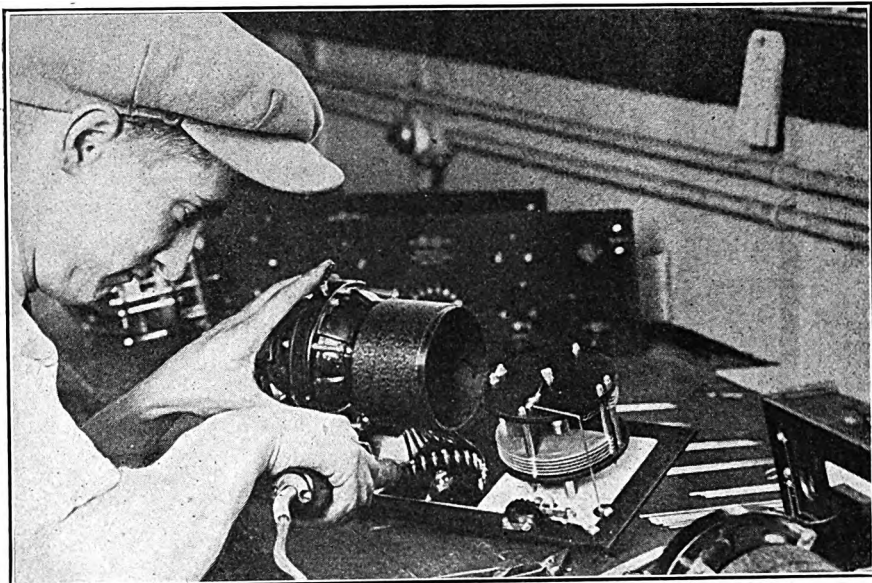
Please send me RADIO WORLD for months, for which

please find enclosed \$

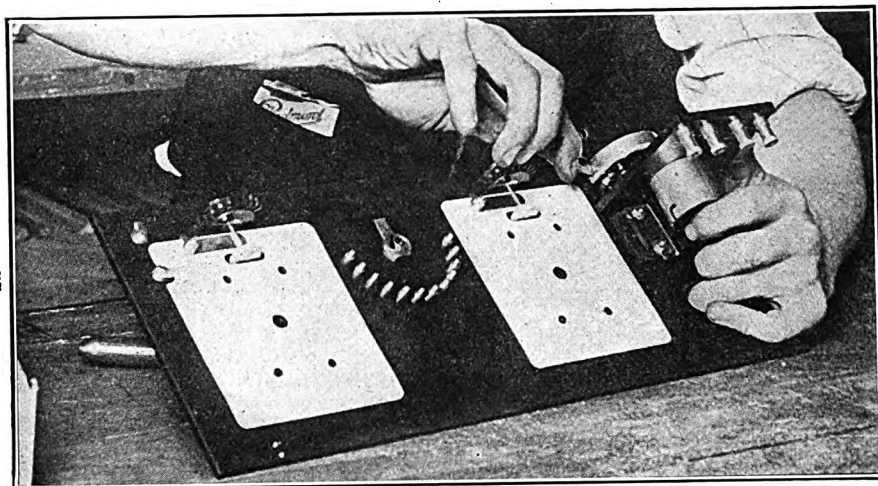
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Single Copy\$.15
Three Months1.50
Six Months3.00
One Year (52 Issues)..... 6.00
Add \$1.00 a Year for Foreign
and Canadian Postage.

Skill Required to Make Radio Sets



No. 1—Wiring a regenerative receiver.

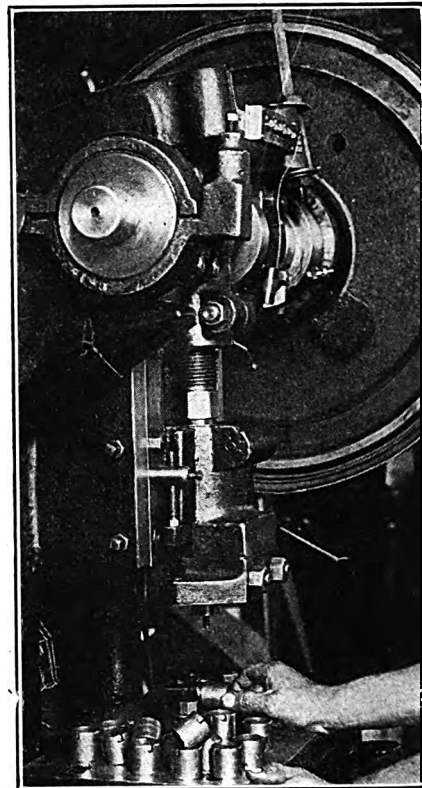


No. 2—One of the important assembling tasks.



No. 3—Testing the completed receiver.

(The four photographs on this page copyrighted by Ewing Galloway, N. Y.).



No. 4—A vacuum-tube slotter.

The Photographs Described

No. 1—Wiring a regenerative receiver. This is one of the final operations before the receiving set is ready for the test. The wireman must complete the circuits from one unit on the panel to the other. Note the short lengths of wire lying on the table. These wires are cut to size and fit into place in the receiving set.

No. 2—One of the assembling tasks. This man is assembling minor parts on the main panel. When the apparatus has reached this stage it is recognized as a radio receiver. It is at this point that all the smaller parts are mounted onto the main panel and made ready for the wireman.

No. 3—Testing the completed regenerative receiver. Each instrument must be tested for mechanical as well as electrical defects. Whether the instrument shall be sent back to the wireman or the assemblyman depends on this man's verdict.

No. 4—Slotting the vacuum-tube sockets which provide a locking device for the tube. This automatic machine is a new type that came into use with the quick growth of radio manufacturing.

THE men and women employees in the various factories now turning out radio equipment are skilled and thorough workers. They must be; for the complete radio set is a complex affair—a machine of many intricate and perfect-working elements, all of which are turned out by the most up-to-date machinery and handled by craftsmen who see a great future in this new and prosperous in-

Radio World's Hall of Fame



(c. Underwood & Underwood)

DR. MILLER REESE HUTCHISON

One of the leading radio engineers of the country. Formerly chief engineer of the Thomas A. Edison interests, now president of Miller Reese Hutchison, Inc., vice-president of the Hutchison Office Specialties Company, and member of the Naval Consulting Board. He has a career along electrical lines, beginning with his eleventh year. Dr. Hutchison was born at Montrose, Baldwin County, Alabama, August 6, 1876.

(Continued from preceding page)
dustry. Many amateurs still prefer to construct their own sets; but, even so, there remain some parts that must be purchased—parts that can be bought cheaper than the amateur can make them.

Massive machinery is used in the great radio factories of the country.

A visit to one of these concerns will impress one that radio-manufacturing machinery is about as up-to-date and thorough as the machinery used in any other industry. This article is illustrated with photographs that prove this statement. The photographs were made in the plant of A. H. Grebe & Co., Richmond Hill, N. Y. They tell

more plainly than words what a high plane the industry has reached in its manufacturing field.

Machinery of the highest order is now being used in manufacturing radio sets. The interior of a big radio factory is a busy, hustling place, and the men and women employed are skilled to the highest degree of workmanship.

Radio Merchandising

National Radio Dealers Association Formed

Special to Radio World

CHICAGO, June 17.—One of the latest steps in radio activities was the formation, here, of the National Radio Dealers Association, with headquarters at 10 North Clark Street, and district offices in New York and San Francisco.

The original group comprised the commercial membership of the American Radio Association, about two hundred dealers. About four thousand radio dealers in all parts of the country have been requested to join by invitation.

The new association has been chartered under the laws of Illinois as a corporation, not for pecuniary profit, is registered in the corporation department of each State and has applied for a national charter. The purpose of the association is to protect and develop the commercial interests of its members, to co-operate with all radio bodies, and establish a definite policy to the buying public.

Plans were discussed for a national convention to be held in Chicago which will be composed of a representative from each dealer in the country. This convention will institute policies and recommendations to be used as a basis of information for national dealers, manufacturers, and policy of jobbers toward the public.

Edward C. Talbott, jr., executive officer of the new organization in an announcement states:

The Bureau of Standards, Department of

Commerce, in a letter endorsing the American Radio Association stated: "The Government believes very thoroughly in co-ordinating the various phases of radio work in this country, and is glad to note that a number of the stated purposes and aims of the American Radio Association, are along these lines." The new association will be a long stride toward the accomplishment of this aim and the elimination of the present commercial radio confusion. The radio public can purchase apparatus from the members of the new association with the utmost confidence, as manufacturers and dealers who produce and sell inferior and inadequate apparatus with no guarantee or scientific construction, and those interested in only a temporary "get-rich-quick" policy in order to take advantage of the uninformed radio public will be excluded.

The new organization will be extensively advertised in a national publicity campaign. National expositions will be held at the time of the annual meeting to bring the various commercial interests together.

An information bureau posting the membership on all radio developments will be established.

A credit bureau will also be organized for the exchange of credit information.

All reputable dealers interested in the scientific, commercial and public permanency of radio are eligible to membership.

Radio Captains of Industry

No. 2—MEYER ROSENTHAL
President, Air-o-Phone Corporation,
New York



Need of Radio in the Home

By Meyer Rosenthal

President of the Air-o-Phone Corporation

THE radio industry has now reached the point where it may be considered a permanent form of entertainment in the American home. Radio concert receiving has a fascination of its own. Listening into the unknown bring-in voices out of the air, is making hundreds of new radio fans every day.

A typical evening's entertainment before a radio receiving set: First, bed-time stories for the children, broadcast from one of the leading radio manufacturing concerns. A minute turn of the dial brings in a piano selection broadcast by a prominent newspaper, turning back the dial brings the end of the bed-time stories, and the children are packed off to bed.

Then the baseball returns which please the male audience. Two new stations are suddenly heard testing their broadcasting equipment by talking to each other. A call for a steamer is heard, and the listeners wait breathlessly for the answer. It comes in, faint but audible, and everyone exclaims, "How marvelous." Then all admit that it does seem uncanny to sit in a room, with all windows closed, and listen to voices hundreds of miles away.

The machine starts to buzz, but a few adjustments bring in two stations—one near New York, the other several hundred miles away. These stations, or selections broadcast by them, come in clear and distinct, but not so loud.

A prominent lecturer speaks for a few minutes. Next, a young lady in the audience tries to tune in some jazz music. She is successful in catching a dance record being broadcast, and an impromptu dance is held.

The feature entertainment of this evening happened to be a complete opera broadcast by a newspaper. It was broadcast, announced, and sung so well that those who were interested in radio understood why radio is bound to develop into a permanent form of entertainment.

Radio, at first thought, appears to be a competitor of the phonograph and the theater; but a careful analysis will show that the radio only competes with the phonograph in the way of the moving-picture theater competes with the speaking stage, or the player piano competes with the phonograph. In other words, radio is a distinct form of entertainment.

Trade Notes

SIDNEY HAMBURGER, GENERAL MANAGER OF THE CANADIAN PACIFIC RADIO CORPORATION, extends an invitation to the trade to visit the offices of the corporation in the Canadian Pacific buildings, suite 708, 842 Madison Avenue, New York City, for demonstrations of radio-receiving sets and inspection of their complete line of parts. The Canadian Pacific Radio Corporation is a thoroughly organized sales and distributing organization, with a large and efficient selling staff, and is in position to give manufacturers of standard radio apparatus most efficient and satisfactory representation.

NEW DE FOREST SETS of greater range and beauty, are now being designed for early production, according to R. M. Keator, general sales manager of the De Forest Radio Telephone & Telegraph Company. The new sets will include a tuner, a radio-frequency amplifier, a detector, and also an audio-frequency amplifier.

"The new line of apparatus," says Mr. Keator "is being designed to satisfy the eye as well as the ear. It will come in period cabinet furniture, suitable for any household or apartment, and will range in price probably from fifty dollars to a thousand dollars."

Latest broadcasting map, 15c. That is, a complete broadcasting map appeared in RADIO WORLD, No. 8, dated May 20. Mailed on receipt of 15c. Radio World Company, 1493 Broadway, New York City.

"Never Saw So Much Hell Over a Small Advertisement"

Gus C. Unkrich
Fairfield, Iowa.
Jeweler

Fairfield, Iowa,
June 5, 1922.

Radio World,
1493 Broadway, New York.

Gentlemen:—

Perhaps it will be interesting to let you know what results I got from the small ad in your paper advertising a Harko Senior Receiving Cabinet for \$15.00. The Radio World must reach over lots of territory as I have been swamped with telegrams and letters. I returned four checks today as I sold the machine to a Chicago man the first day. I am just returning a check by this same mail to a man in Maryland. I also have a bunch of Radio World letters from parties setting forth what they would trade for the cabinet; in fact, I never saw so much Hell over a small ad. Thanks to you.

(Signed) GUS C. UNKRICH.

New Firms and Corporations

Notices in this department are considered as purely interesting trade news and published without compensation to us. We welcome trade news of this nature. All notices having an advertising angle are referred to our Advertising Department, and are placed under Classified Advertising at 5 cents a word, or as Display Advertising at \$5 an inch.

(The firms and corporations mentioned in these columns can be reached by communicating with the attorneys, whose addresses are given whenever possible.)

Blatt Radio Specialty Co., Manhattan, \$5,000; M. Blatt, B. Neuwirth, G. Horowitz, (Attorney, E. J. Garvar, 74 Graham Ave., Brooklyn, N. Y.)

Mercury Radio Corp., Manhattan, electrical works, \$20,000; M. Levy, O. W. Bennett, E. Olson. (Attorneys, Bennett, Weiner, Tronfelt & Grenthal, 2 Rector St., N. Y.)

Inland Radio Telegraph Co., Wilmington, apparatus, \$250,000. (Corporation Trust Company of America.)

Capitol Radio Sales Agency, 911 Mather Building, Washington, D. C.

Radio Equipment Laboratories and Roth's Music Store, Leechburg, Pa.

The Victor R. Vall Co., 95 Metropolitan Ave. Brooklyn, N. Y.

Monmouth Radio Service Co., Robert Johnson, Harold Allen, treasurer; Harold Davison, secretary. White St., Red Bank, N. J.

Radio Vacuum Electric Co., Station O. Box 103, Toledo, Ohio. Manufacturing vacuum bulbs used in wireless outfits.

The Simplicity Radio Corporation, Cincinnati, subsidiary of the Aerophone Radio Corporation, Wilmington, Del.

Charles E. Hayes Company, jobber of radio supplies, Springfield, Mass.

Kramer Radio Company, radio distributors and jobbers, 4713 Sheridan Road, Chicago. This firm would like to get in touch with reliable manufacturers looking for proper distribution in the Middle West.

F. A. Rose, Two Harbors, Minnesota. "Started recently and going good," writes Mr. Rose.

Gordon Radio Company, Gordon, Nebraska.

R. R. Garrick, 126 North Redfield street, Philadelphia. Mr. Garrick says: "Have started in business not so much to make money, but to help the real amateur get the best material."

Alladin Radio Mfg. Co. Manufacture radio and wireless apparatus. \$15,000. William A. Leyda, Julian A. Ramsey, Rea J. Thompson, Washington, Pa. (Capital Trust Co.)

Rhineland Radio Mfg. Corp., Manhattan, \$500,000; J. W. Sawson, E. Rhine, D. W. Friedlander. (Attorneys, Berger & Hartman, 217 Broadway, N. Y.)

Radio X Corp., Manhattan, \$10,000; E. A. Abrahams, E. M. Lovell, H. A. Hayward. (Attorneys, Flaherty, Turner & Strouse, 2 Rector St., N. Y.)

Resulite Corp. of America, electrical contracting, \$500,000; Theodore L. Ernst, S. E. Freeland, Samuel Baras, New York. (American Guaranty & Trust Co.)

Twentieth Century Wireless Telephone Corp., White Plains, N. Y.

Sleeper Radio Corp., New York City, has increased its capital from \$25,000 to \$250,000.

Alladin Radio Manufacturing Co., apparatus, \$15,000; William A. Leyda, Julian A. Ramsey, Rea J. Thompson, Wilmington, Pa. (Capital Trust Company.)

General Radio and Electric Corp. of America. Wilmington, radio sets, \$5,000,000. Corporation Trust Company of America.)

S. G. K. Radio Corp., Wilmington, Del., apparatus, \$100,000. (Corporation Trust Co. of America.)

A Receiver with An Appropriate Name



The "Vox Humana"

A radiophone receiver in a beautiful period-design cabinet, which made its first appearance at the recent New York Radio Show. It is known as the "Vox Humana." While embodying many original features in the set, the designers have particularly attempted to obtain the most natural reproduction of the human voice transmitted by radio telephone possible to obtain. They have apparently succeeded beyond their expectations. The demonstrator merely pushed a switch and the voice of the announcer at WJZ emanated from the horn in the cabinet in such natural tones that it was hard to believe that it was not someone in the room who was speaking. The voice was loud, but not too loud, and there was a total absence of extraneous noises. When the voice ceased there was absolute silence. The machine does not seem to know what static or interference means.

Write us for full information concerning

Radiobat B

The Revolutionary Battery For
Wireless Telephony.

Multiple Storage Battery Corp.

350 Madison Avenue New York

READ RADIO BOOKS

By JAMES R. CAMERON

HOW TO BUILD YOUR OWN RADIO SET \$.25

RADIO DIRECTORY..... 50

RADIO FOR BEGINNERS 1.00

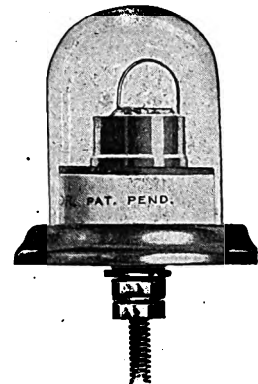
Buy them to-day from your dealer or direct from

TECHNICAL BOOK COMPANY

130 WEST 42nd STREET NEW YORK

Does Summer Static Bother You?

IT WON'T WITH THIS
RADIO DETECTOR



(Actual Size)

PRICE \$2.00

In using the GREWOL you don't have to find the spot.

THIS DETECTOR IS
ALWAYS SET AND READY

GUARANTEED ONE YEAR
IF YOUR DEALER DOES NOT
HANDLE THE GREWOL SEND
US \$2.00 AND WE WILL MAIL
ONE TO YOU.

DEALERS WRITE FOR
PROPOSITION

RANDEL WIRELESS CO.

9 Central Ave. Newark, N. J.

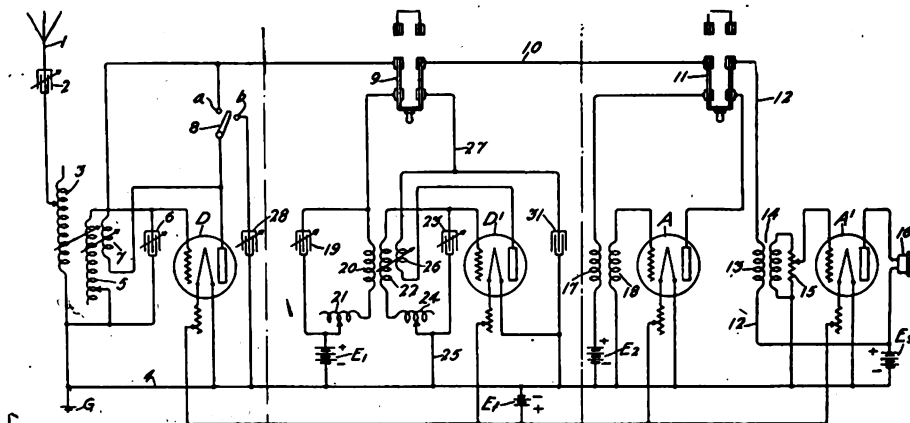
COMPLETE YOUR FILE OF RADIO WORLD

Copies of Radio World No. 1

If you did not get a copy of Radio World No. 1 send us \$6.00 and we will send you the paper for one year, and start it with our first issue, which will be mailed you as soon as possible after receipt of order. (Adv.)

Radio Patents

RECENTLY ISSUED



Schematic diagram showing the Clement circuit. Four tubes are used which may be utilized by the operator, either cutting in one or more tubes.

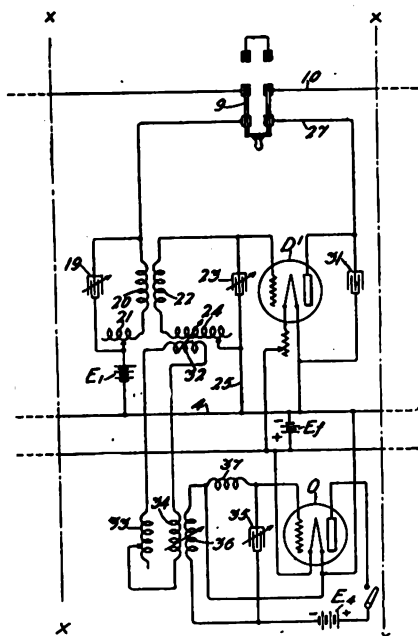
Lewis M. Clement, of Newark, N. J., has invented a device to regulate waves in an electromagnetic receiving station. By his invention he hopes to produce a receiving station capable of receiving many kinds of signals efficiently, and particularly one in which a detector circuit may act to detect waves of one or more kinds and, also, in combination with another or other detecting-circuit arrangements may detect waves having one or more different characteristics.

A more specific object is to produce a station in which a single detector circuit may receive simple damped wave trains of

circuits which may be rapidly and conveniently tuned to receive plurally or successively modulated or modified waves.

A still further object is to produce a system capable of receiving signaling waves in a plurality of different ways and which may be rapidly and readily changed from a condition adapted to one method of reception to a condition adapted to another method of reception.

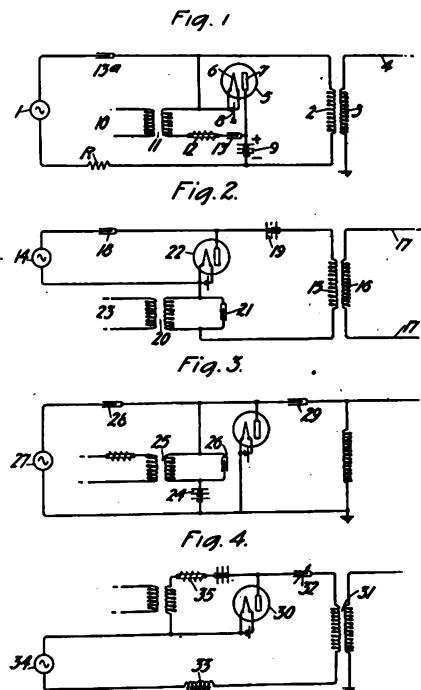
* * *



Schematic diagram showing another circuit of Mr. Clement's patent.

long or short wave length and sustained oscillations of long or short wave length, and also may act as one of a set of detectors to detect plurally modulated or modified waves.

A further object is to produce a system



Schematic diagram of Mr. Tanner's electrical signaling circuit for high-frequency currents.

De Witt C. Tanner, of Glen Ridge, N. J., has been awarded patent papers on a system for electrical signaling and more particularly to circuits and apparatus for modulating high-frequency electrical oscillations or impulses in accordance with

Father Urges Son to Prefer Radio to Amusement



(C Underwood & Underwood, N. Y.)

One of the most ardent young radio enthusiasts in Washington is Dederick Ten Eyck, the fourteen-year-old son of Congressman Peter G. Ten Eyck, of New York. The congressman says he prefers to have his son entertained by a radiophone than any other form of amusement he might wish, so he has procured one of the best radiophones in the market.

"Music in de Air, Suah!"

Soap Monroe, a colored chimney cleaner of Greenville, Ala., while engaged in cleaning a smoke-stack for the W. T. Smith Lumber Company there heard the strains of "Dixie" coming from the deep pit of the stack. Soap and his two companions climbed from the stack to see the parade. There was no parade and investigation proved that there was no band within miles. Soap Monroe started to run and is supposed to be still at it. His two companions, Bert Harrison and Ed. Cooper, verified the report and said that the music was very clear and loud. The stack of the plant is supported by a number of guy wires which it is believed picked up a radio message and in some freak manner the chimney acted as a receiver.—"The Journal," Providence, R. I.

signaling currents or other low-frequency electrical variations.

The principal object of this invention is to provide a modulating circuit in which a two-element electron discharge-device may be used as a modulator.

According to this invention, high frequency oscillations are impressed across the terminals of a two-element electron discharge-device simultaneously with low frequency electrical variations, which may be signaling currents such as are used in telephony and telegraphy, control currents, or impulses such as are used in selecting systems. A source of unidirectional current maintains an electron discharge between the electrodes of the discharge-device, and the effect of the high frequency and low frequency oscillations is to cause a variation in the electron discharge. This variation component gives rise to an alternating current of the high frequency and of an amplitude varying in accordance with the low frequency current.

Investigate Before Investing!

President Alexander Eisemann, of the National Radio Chamber of Commerce, Gives an Important Interview on the Necessity of Careful Investigation Before Investing in Radio Stocks and Financing Irresponsible So-Called Experts

MILLIONS were lost in oil, but there will be many millions more lost in radio," predicts Alexander Eisemann, President of the National Radio Chamber of Commerce, and a member of the Freed-Eisemann Radio Corporation, of this city.

The radio situation, Mr. Eisemann points out, is well on the way to parallel the oil boom, and in the wake of the tremendous enthusiasm generated, unscrupulous promoters and so-called "experts" are relieving small investors of their savings. "Several cases have come to my attention within the last few months," continued Mr. Eisemann, "and in the interests of fair play and the general good, I urge the widest possible publicity to this warning."

"Hundreds of thousands of people throughout the country think that radio is a 'gusher,' that it brings back in dividends many times the principal invested. Many small business men who would think twice before investing their money in gilt-edge securities, never hesitate when the magic word 'radio' is whispered to them. They read of the tremendous strides of the radio industry within the last few months, they hear things on all sides, and make up their minds that the dollars they worked so hard for through many years, should 'get out of the bank and get into radio.'"

"It is estimated that within the last three months, at least 1250 new corporations have been organized to manufacture radio apparatus. Obviously, all these cannot have technical skill of requisite standard back of them. And certainly, in all this mass of ignorance and lack of expert knowledge, many of these new corporations must fail. As an instance, let me cite the case of a personal friend, who, despite advice to the contrary, invested and lost in backing a radio-receiving set, the design of which conflicted with another manufacturer's patents."

"Shoemakers, jewelers, hair-dressers, cloak-and-suit manufacturers, are stampeding into the radio business, usually forsaking a perfectly profitable business in their haste to get into the much-advertised 'radio gold mine.' These men, usually keen in business affairs, become enthused when their office boy tells them of a new radio set he made home, at a cost of only \$2.98! This is an actual happening. Or, a self-styled 'radio expert,' formerly a wireless operator in the Army or Navy, interests a merchant by suggesting the wonderful profits that lie in store for him, if he will only advance a few thousand dollars to put this 'expert's' product on the market."

"A young man approached me recently and wanted to know whether I would consider backing an 'automatic antenna erector,' which operated like a jack-in-the-box and was to be erected instantaneously on all roofs anywhere! This self-styled 'radio expert' was formerly a floor-walker in a department store and tinkered around the batteries when the

electric buzzers were out of order! Yet, with all this pathetic lack of radio engineering experience and dearth of business knowledge, it is not improbable that he has found some otherwise keen-minded business man to sponsor his queer project with real, hard-earned cash!"

"In addition to the basic engineering and financing problems," continued Mr. Eisemann, "there is always the manufacturing and marketing problems which must be solved before investments can pay back one penny on their principal. For example, let me cite an instance with which I am familiar."

"A jeweler decided to go into the radio business and backed a young friend's radio invention to the extent of \$20,000 on the strength of his statement that he could make a good radio set for nine dollars that could retail for twenty-five dollars, with a dealer's discount of thirty-three and one-third per cent. Of course, the young man made up a demonstration set with a cost sheet, which proved conclusively that the set could be made for less than nine dollars. However, a kind friend showed this merchant that while the set apparently cost nine dollars to make, necessary inspection at each stage of the operation brought the cost to ten dollars. Further, that when large quantities were built, experience had shown that thirty-seven and one-half per cent of the sets would be rejected before the final inspection, and would have to be either repaired or, in some cases, rebuilt! This merchant also learned at the cost of much money, that of every hundred pounds of galena crystal he tested for his sets, ninety-three and one-half pounds had to be carefully tested and rejected as useless, while only six and one-half pounds of the tested crystal could be used!"

"Materials were advancing in price, and this merchant also learned that deliveries and manufacture of necessary materials were being delayed for weeks and months, and that in order to get price concessions and early deliveries, he had to buy large quantities of materials, much of which lay on his hands for months, some never to be used!"

"The case of this manufacturer is typical," explained Mr. Eisemann. "Investigations made by the Freed-Eisemann Radio Corporation have brought out the astounding fact that at least thirty-seven radio apparatus manufacturers at the present time are infringing upon each other's patents, and that at least one thousand other manufacturers are infringing upon the patents of several older radio concerns! Of course, the man who invests his money in these businesses must suffer!"

To many anxious inquirers RADIO WORLD has no free list. One copy is sent as a voucher to each advertiser or advertising agent represented in current issues. All other copies are paid for on subscription or through the news trade.

Radio brings it
MAGNAVOX
tells it

An essential
part of every
receiving set

R-2
with
18-inch
horn

Price \$85.00

NO matter how carefully you have selected your radio receiving units—no matter how efficiently you have installed them—if you are still using a telephone headset you have a very pleasing experience in store.

It is Magnavox Radio, the reproducer supreme, which makes the receiving set wholly useful and enjoyable.

With the Magnavox Radio you hear every wireless program at its best—your receiving set only brings the message, while Magnavox Radio tells it clearly and in full volume to all within reach of its voice.

To secure maximum power input for your Magnavox Radio, add Magnavox Power Amplifier Model C-2 or 3 stage—designed specially for power tubes.

Any radio dealer will demonstrate, or write us for descriptive booklet and name of nearest dealer.

The Magnavox Co.

Oakland, California
N.Y. Office: 370 Seventh Ave.

MAGNAVOX
Radio



Answers to Readers

WHICH of the enclosed hook-ups is the best? Will the aerial, as shown in the diagram, be as good as a 150-foot aerial T type?—Joseph Lyon, Albany, N. Y.

Your hook-ups are nearly all the same. You may use any of them.

* * *

I am making a variometer receiving set, but find that it will only work to 800 meters. How can I make a variometer that will tune to 1500 meters?—"Wireless Bug," Minneapolis.

This type of variometer will not be practical at a 1500-meter wave length, as it will be too large. We advise you make a honey, or due-lateral, coil set, as this will enable you to use most any wave length desired.

* * *

Will the enclosed sample of wire be all right for my aerial?—John O'Rourke, Youngstown, Pa.

The wire will be all right for an aerial that is used for receiving. It is small in size and will break easily, but it will serve your purpose.

* * *

With a home-made crystal set, I hear code plainly; but music, not so plainly. Why?—Saul Bender, Milwaukee, Wis.

Not sharp enough tuning on your coils. Use a series condenser to regulate wave length, and a shunt secondary variable condenser.

* * *

Can I procure a book containing all

Owing to the large numbers of questions received from readers it is impossible to answer all in this number. Your replies will appear in the next or future numbers of Radio World.

radio amateur and broadcasting stations?—Joe Murz, Lyndenhurst, N. Y.

This book can be had from the Superintendent of Documents, Government Printing Office, Washington, D. C., on receipt of 15 cents.

* * *

I am considering buying a set and desire to choose of the following: X, Y and Z. Which will give the best results? Fan, New Rochelle, N. Y.

It is against all rules to specify any particular type by name, but from my past experience I would choose Y. This is the best by far.

* * *

A friend has a set composed of a hundred-foot aerial, vario-coupler, primary, secondary and tickler, tube equipment, and 2000-ohm head-phones. What should be the hook-up? What should be the capacity of the grid condenser?—Theodore Fehlardt, Ripon, Wisconsin.

See Radio World, No. 5, dated April 29, for correct hook-up. See that all your connections are correct before soldering. Make all leads as short as possible.

The grid condenser should have a capacity of about .00025 mfd.

* * *

Will diagram for set described work satisfactorily?—M. Tilden, Stanwood, Iowa.

Yes. This circuit should work well; in fact, better than placing the batteries in the straight-type hook-up. Would advise you to leave out your 23-plate variable condenser. This is a regenerative circuit. Coupling of 180 degrees is better than 90 degrees.

* * *

I have a paragon-detector panel-control and have two binding posts, which are not marked, and don't know what they are. Signals simply fade away.—M. B. Vansdesdale, Spring Lake, N. Y.

Would advise you to take this matter up with the Adams Morgan Co., Upper Montclair, N. J.

* * *

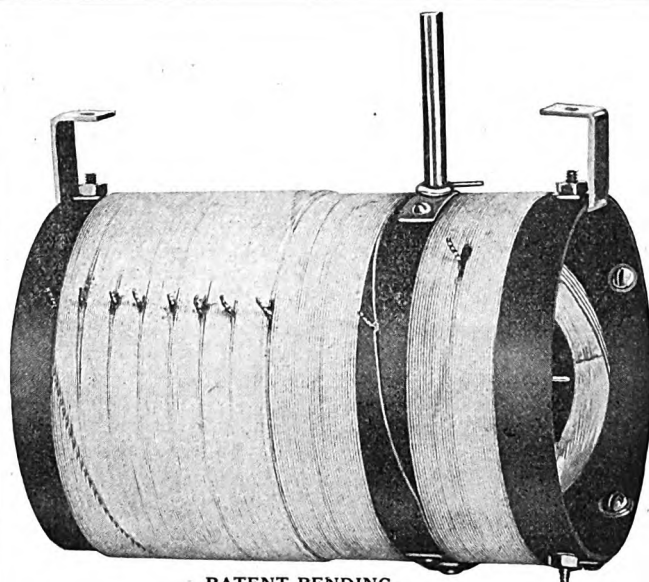
Can you tell me what other part I need to give more selective tuning without getting two steps for my outfit?—Earl S. Schwing, Canton, Ohio.

You failed to furnish a diagram, so we are still in the dark as to the exact results obtainable. However, we believe that you are getting the best results by using only one tube.

* * *

Where can I buy a radio dictionary?—Ben Westfield, New Brighton, S. I.

Apply to any of the firms, advertising in RADIO WORLD, that sell books.



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 FLAT AND BANK WOUND COUPLER
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 For selective long wave and
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Static can be drained off your lead-in wire as water is carried from a roof—automatically. Just say JACOBUS to your dealer or show him this ad.

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KDZD—W. R. Mitchell, Los Angeles, Cal.

KDZE—The Rhodes Co., Seattle, Washington.

KDZF—Automobile Club of Southern California, Los Angeles.

KDZG—Cyrus-Peirce Co., San Francisco, Cal.

KDZH—"Fresno Evening Herald," Fresno, Cal.

WDAK—"Hartford Courant," Hartford, Conn.

WDAL—"Florida Times Union," Jacksonville, Florida.

WDAM—Western Electric Co., New York, N. Y.

WDAN—Glenwood Radio Corp., Shreveport, La.

WDAO—Automotive Electric Co., Dallas, Texas.

WDAP—Midwest Radio Central Inc., Chicago.

WDAQ—Hartman Riker Elec. Co., Brownsville, Pa.

WDAR—Lit Bros., Philadelphia.

WDAS—Samuel A. Waite, Worcester, Mass.

WDAT—Delta Electric Co., Worcester, Mass.

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WDAX—First National Bank, Centerville, Iowa.

WDAY—Kenneth M. Hance, Fargo, N. D.

WEAA—Fallain & Lathrop, Flint, Mich.

WEAB—Standard Radio Equipment Co., Fort Dodge, Iowa.

WEAC—Baines Electric Service Co., Terre Haute, Ind.

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WEAK—Julius B. Abercrombie, St. Joseph, Mo.

KDZR—Bellingham Publishing Co., Bellingham, Wash.

WEAI—Cornell University, Ithaca, N. Y.

KDZI—Electric Supply Co., Wenatchee, Wash.

KDZJ—Excelsior Radio Co., Eugene, Oregon.

KDZM—E. A. Hollingworth, Centralia, Wash.

KDZK—Nevada Machine & Electric Co., Reno, Nev.

KDZQ—William D. Pyle, Denver, Colo.

KDZP—Newbery Elec. Corp., Los Angeles, Calif.

WEAG—Nichols - Heneline - Bassett, Edgewood, R. I.

WEAM—North Plainfield, N. J.

KDZL—Rocky Mountain Radio Corp., Ogden, Utah.

KDYX—Star Bulletin Publishing Co., Honolulu, T. H.

WEAH—Wichita Board of Trade and Landus Radio Co., Wichita, Kansas.

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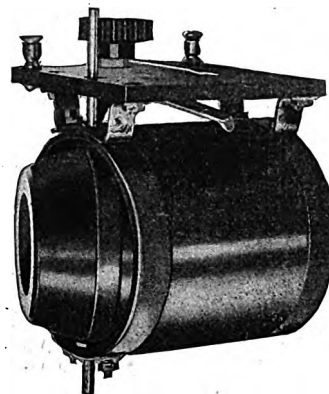
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Radio Products of Dependability Are Always Good Sellers—Try Them



Our "EVERY-WIRE-CONTACT" Coupler as illustrated is made strictly along scientific lines—the primary coil has a lever contact affording an every-wire-adjustment of this element which eliminates the disadvantages of the old style primary or tuning coil with soldered taps and its poor selectability—at the same time the rotor is accurately fixed with perfect air gap allowing further finer tuning—the unit is ideal for use in regenerative or crystal sets.

We Are Prepared to Ship In Quantity.

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You can earn from \$1 to \$2 an hour in your spare time writing show cards. Quickly and easily learned by our new, simple "Instructograph" method. No canvassing or soliciting; we teach you how, guarantee you steady work at home no matter where you live, and pay you cash each week.

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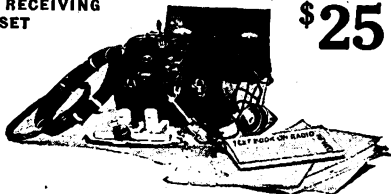
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With Double Head Phones

Also Copper Antenna Lead Wire, Ground Wire, Insulators and all the necessary parts that will enable you to hear everything within a range of from 25 to 50 miles.

Also included is a radio text-book with complete instructions and valuable charts.

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358 FIFTH AVENUE NEW YORK CITY

Is Your Tuning Device Sufficiently Sensitive

MUCH of the complaint about interference that comes from novices in radio receiving is due to the use of tuning devices that are not sufficiently sensitive, says a writer in "The Literary Digest," New York. In the usage of the experienced amateur, the type of tuning coil known as a variometer has pretty generally taken the place of the single-tapped induction coil and the familiar loose-coupler. A tapped coil serves very well where it is not necessary to distinguish too closely between wave systems; but may prove inadequate when really nice discrimination is in question. The variometer, consisting essentially of two coils, one of which rotates on its axis within the hollow of the other, permits the most infinitesimal gradation of adjustments. In one position, the two magnetic fields coalesce and mutually strengthen each other; as the inner coil is rotated, the mutual relations of the magnetic fields are indefinitely modified, and at 180 degrees they are fully opposed. The inductance of the antenna system is thus shifted from minimum to maximum, tuning for waves of all available lengths, by merely turning the knob attached to the axis of the "rotor" coil.

Some of the most elaborate radio-receiving outfits on the market use this system. One that has three stages of audio-frequency amplification has carried automatic control of rheostats and condensers to such a stage that nothing whatever is required of the operator who would "listen in" but to turn the pointer on a single dial, thus operating the variometer, guided solely by results. You have merely to turn the pointer until the sound you wish to hear is loudest and clearest—and then sit back and listen. Once the pointer is adjusted, it may be left there, and if you wish to listen to the same station on another evening, all that is necessary is to push a button, just as you turn on an ordinary electric light.

Indoor Aerials Preferred

A MATEURS of Elizabeth, N. J., says the New York "Globe," which is a hotbed of radio activity, are frankly skeptical of the experts' repeated statements that indoor aerials won't work with crystal sets.

Martin J. Corcoran, principal of the Boys' Vocational School, and one of Elizabeth's foremost radio experimenters, is one of them. Mr. Corcoran, after trying out both kinds, announces himself as in favor of the indoor variety for crystal as well as bulb sets. He states that his conclusion is based on his own experiments and trials made in Elizabeth by his pupils.

He explains that indoor aerials are found to be far superior to outside ones in cases where conditions are not ideal for the outdoor antennae, where long straightaway stretches of wire can not be erected or where tin roofs or other objects which lessen an outside aerial's efficiency can not be avoided.

Mr. Corcoran reports that in his own case, a continuous wire, 144 feet long, strung in four lengths in his attic, with one end leading to his set, gives him better results than he obtained with a 200-foot outside aerial. He states that he finds the efficiency of the indoor aerial is increased by running a loop from the free end to the section of wire leading from his receiving set.

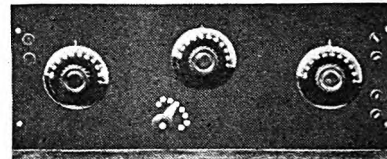
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The above instrument comes to you completely assembled, ready to wire; all parts mounted on genuine Formica Panel, set in quartered oak cabinet with hinged cover. Panel is properly shielded so that no "body effects" are experienced with this instrument.

This is truly a HI-GEE quality instrument consisting of two variometers, one vario-coupler, socket and rheostat. (Rheostat not shown in above cut).

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Be a Radio Expert

I will train you quickly and easily in your spare time, to become a RADIO EXPERT so you can install, construct, repair and sell RADIO equipment. I am a Graduate Electrical Engineer and from actual experience I will give you exactly what you must know to make the really big money in radio.

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1493 Broadway, New York City

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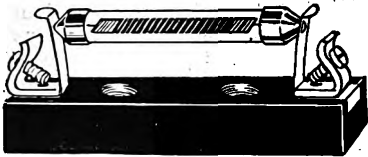
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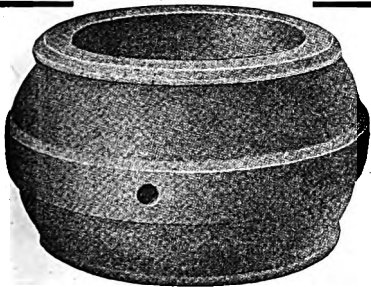
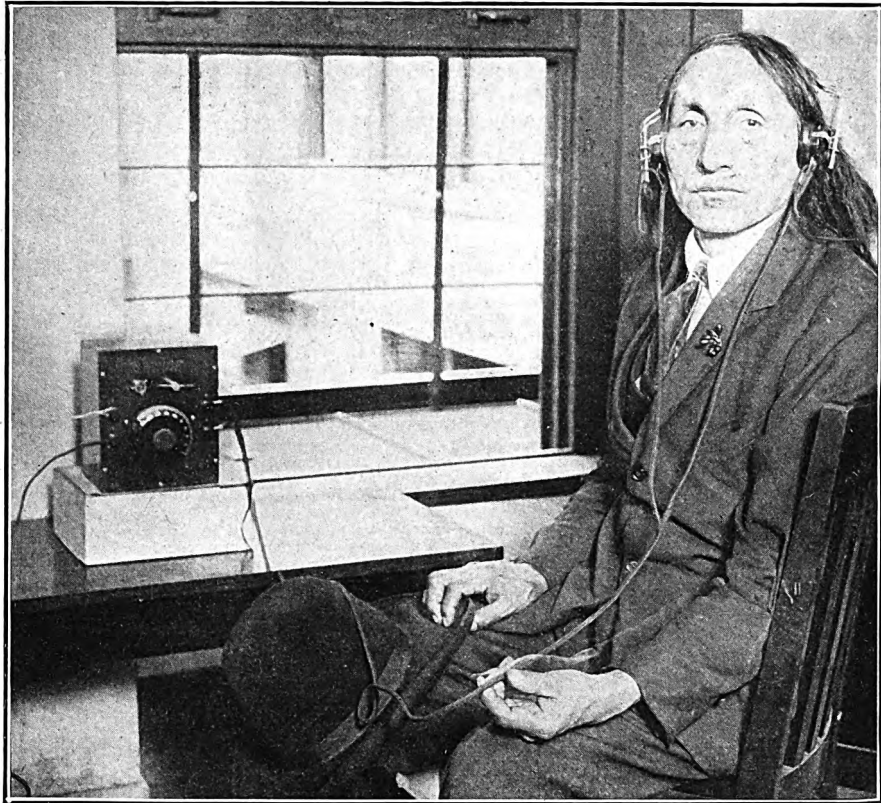
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FLORENCE, S. C.**QUESTIONS and ANSWERS**Ask **RADIO WORLD** any questions about Radio. Subscribers are answered in next week's issue. New wonders of the marvelous wireless illustrated and fully described in each weekly issue. All newsstands at 15c a copy. Subscriptions, 3 months, \$1.50; six months, \$3.00; one year, (52 numbers), delivered to your home, \$6.00. **RADIO WORLD**, Room 326, 1493 Broadway, N. Y. C.**Hears White Fathers' Signal Fire**

(C. International Newsreel Corp.)

Chief Sherman Charging Hawk whose only knowledge of sending and receiving long-distance messages was that of the Indian's beacon fire placed on a high hill. Here he is photographed, experiencing, for the first time, the receiving of messages by the white father's latest invention. A concert broadcast over distant leagues has given him his first idea of the world's greatest advancement.

Radio on the Farm

There was a time when there was general sympathy among city dwellers for the wives and daughters of the farmers of the country, remarks "The Evening Telegram," New York. Those who had all the resources of civilization around the corner could not understand how persons in the rural districts ever managed to endure the boredom of existence.

The flivver was the first invention to mitigate the misery of the remote.

It placed the nearest town, with its moving picture shows and other delights, at the disposal of the rustic population.

Now comes the radio to place the farmer and his family in touch with the doings of the great world that lies beyond the horizon.

It is the town dweller who has the worst of it. He or she has to travel in subways, hurry to catch trains, to be on the rush in and out of business hours all the time.

Instead of the agriculturist going to the city, the city is going to the agriculturist.

RADIO WORLD

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ASSOCIATE EDITORS:

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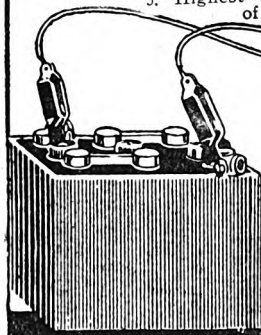
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2. No delicate bulbs to break or burn out. Only one moving and two wearing parts. These are replaceable as a unit, after thousands of hours' use, at small cost. Cannot be injured by rough handling.
3. Operation stops and consumption of current ceases immediately upon disconnecting battery.
4. The only charger costing less than \$100.00 that will fully charge a battery over night. Gives battery a taper charge—exactly as recommended by battery manufacturers. Guaranteed not to harm your battery even though left connected indefinitely.
5. Highest efficiency of any three or six cell charger made. 6. No danger of fire. Approved by Underwriters. Immediate Delivery.

Attention Motorists. Will charge your auto battery as well as radio battery. Send for Bulletin No. 58 for further information. For sale by all radio, electrical and accessory dealers or shipped, express prepaid, for purchase price, \$18.50. \$20 West of Rockies.



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135 WEST THIRD STREET CINCINNATI, OHIO
BRANCH OFFICES—New York, Chicago, Pittsburgh,
Los Angeles, New Orleans, Detroit, Toronto, Philadelphia, Baltimore, Dallas.

Broadcast Bill's Radio-lays

By William E. Douglass

(Copyright, 1922, Westinghouse Electric & Manufacturing Co.)

WE had a bang-up party in our town the other night—I'll start at the beginnin' so you'll get the story right. Last week I shipped a car o' hogs to my friends, Swift and Coe, an' I went to the city, too; thought I'd take in a show, an' look the old town over, strollin' down some gay white way where people never start to bed till night is almost day. Now since my mind's on radio, o' course, I looked aroun' to see if wireless shops in that town could be found. Well, sure enough I found some, guess there must a been a dozen; a feller there in one of them told me he wuz a cousin of the chap that sold me my first set out there in Brussels Sprouts. He might not been a lyin', but I kinda have my doubts. I told him that I wanted two more pairs of earmuffs so my wife an' I could listen an' a pair fer little Joe. An' then he



showed me somethin' I could add on to my set to make the thing talk right out loud, I didn't hafta fret about those rubber earmuffs. You could hear this thing a block—I said, "Young fella, wrap it up." (The price gave me a shock.) To shorten up my story, t'other night we had a dance, there ain't been nothin' like it in this country here ner France. Now all the folks frum miles aroun' had gathered in the hall, an' when we waited 'bout an hour afore we had a call frum Si, who plays the fiddle; said he guessed he couldn't come. Well! gosh, you know that dern near put the party on the bum. His baby had the colic, and his wife was feelin' sick. Right then I had an idee—radio would turn the trick, an' so I beat it home an' got my bran new wireless set an' took it to the hall to try and see what I could get. An' orchestra was playin', right away the dance begun. It didn't stop till midnight, and we had lots of fun.

Radio without Interception

A Ukrainian engineer is reported to have discovered a method by which radio messages may be sent to a definite receiving station without the danger of being intercepted by other stations, says "Scientific American." It is stated that by means of a simple apparatus the so-called "locked power line" of the magnetic field may be straightened out and grouped into parallel rays. These rays are said to do away with the necessity of aerals. If this report is true, it seems that we are on the verge of a new epoch.

Radio Supplies AT A BIG SAVING

	List Price	Our Price
Radiotron UV 201 Amplifying Tube....	\$6.50	\$5.85
Western Electric Phones, 2,200-ohms, Per pr.	15.00	13.50
Murdock Phones, No. 56, 3,000-ohms, Per pr.	6.00	5.40
Federal Phones, 2,200-ohms, per pr....	8.00	7.00
Acme A-2, Amplifying Transformers Semi-mounted	5.00	4.50
Paragon Amplifying Transformers, mounted	5.00	4.50
Federal Plugs	1.75	1.50
Everready B Battery, Type 766, 22½ Volt	3.00	2.50
Everready B Battery, Type 763, 22½ Volt	1.75	1.35
Brach Vacuum Gaps for lightning protection, Inside Type	2.50	2.25
Outside Type	3.00	2.75
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Paragon Rheostats	1.50	1.35
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All orders shipped the day of receipt, postage free. If you are not entirely satisfied with anything you order, return it and your money will be promptly refunded without question. Order from Gregory and save money. Send it in TO-DAY!

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The publisher has reserved a limited supply of the first twelve issues of RADIO WORLD for the benefit of new readers who want to become subscribers and have their files complete from the first issue. The first twelve copies will be mailed postpaid on receipt of \$1.50; or better still, subscribe now for six months (\$3.00), or twelve months (\$6.00 for 52 issues) and have your subscription start with No. 1. Radio World Co., 1493 Broadway, New York City.

de Forest
RADIO
"The Standard of Dependability"
DeFOREST RADIO TEL. & TEL. CO.
JERSEY CITY, N. J.

New Broadcasting Schedule FOR Ten Metropolitan Stations

Appended is a tentative schedule of operations for the ten broadcasting stations located in the metropolitan area. This was agreed on at a meeting of representatives of the ten concerns. It is now being tried out.

Time	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.	Sun.
8 to 9 a. m.	Testing	Testing	Testing	Testing	Testing	Testing	Testing
9-9:15	WJZ	WJZ	WJZ	WJZ	WJZ	WJZ	WJZ
9:15-10	WHN	WHN	WHN	WHN	WHN	WHN	WHN
10:00-10:30	WAAM	WHN	WHN	WHN	WAAM	WHN	WHN
10:30-10:50	WHN	WHN	WHN	WHN	WHN	WHN	WHN
11:00-12	WAAM	WBAN	WAAM	WBAN	WAAM	WBAN	WBAN
12:00-12:30	WBAY	WBAY	WBAY	WBAY	WBAY	WBAY	WBAY
12:30-12:50	WJZ	WJZ	WJZ	WJZ	WJZ	WJZ	WJZ
12:50-1 p. m. ...	WBAN	WBAN	WBAN	WBAN	WBAN	WBAN	WBAN
12:55-1 p. m. ...	WHN	WHN	WHN	WHN	WHN	WHN	WHN
12:55-1:15	WJZ	WJZ	WJZ	WJZ	WJZ	WJZ	WJZ
1:15-2:15	WWZ	WWZ	WWZ	WWZ	WWZ	WWZ	WWZ
2:15-2:30	WHN	WHN	WHN	WHN	WHN	WHN	WHN
2:30-3:00	WOR	WOR	WOR	WOR	WOR	WOR	WOR
3:00-4:00	WOR	WOR	WOR	WOR	WOR	WOR	WOR
4:00-4:15	WJZ	WJZ	WJZ	WJZ	WJZ	WJZ	WJZ
4:15-4:30	WAAM	WAAM	WAAM	WAAM	WAAM	WAAM	WAAM
4:30-5:00	WHN	WHN	WHN	WHN	WHN	WHN	WHN
5:00-5:30	WBAY	WBAY	WBAY	WBAY	WBAY	WBAY	WBAY
5:30-6:00	WBAY	WBAY	WBAY	WBAY	WBAY	WBAY	WBAY
6:00-6:15	WJZ	WJZ	WJZ	WJZ	WJZ	WJZ	WJZ
6:15-6:30	WOR	WOR	WOR	WOR	WOR	WOR	WOR
6:30-6:45	WOR	WOR	WOR	WOR	WOR	WOR	WOR
6:45-7:00	WBAN	WBAN	WBAN	WBAN	WBAN	WBAN	WBAN
7:00-7:30	WOR	WOR	WOR	WOR	WOR	WOR	WOR
7:30-8:00	WJZ	WJZ	WJZ	WJZ	WJZ	WJZ	WJZ
8:00-9:00	WBS	WWZ	WBS	WBAY	WBS	WJZ	WAAT
9:00-10:30	WRW	WRW	WRW	WRW	WRW	WJZ	WJZ
10:00-12	WHN	WHN	WHN	WHN	WHN	WJZ	WJZ
	WAAT	WAAT	WAAT	WAAT	WAAT	WJZ	WJZ
	WBAN	WBAN	WBAN	WBAN	WBAN	WJZ	WJZ
	WOR	WAAM	WBAY	WWZ	WJZ	WJZ	WJZ
	WJZ	WJZ	WJZ	WBAY	WJZ	WJZ	WJZ
	WJZ	WJZ	WJZ	WBAY	WJZ	WJZ	WHN

Key—WJZ, Westinghouse, Newark; WWZ, Wanamaker, New York; WBAY, American Telephone and Telegraph, New York; WBS, May & Co., Newark; WHN, Ridgewood, N. J.; WRW, Koenig, Tarrytown; WAAT, Jersey City; WBAN, Wireless Phone Company, Paterson, N. J.; WAAM, Nelson, Newark; WOR, Bamberger, Newark.

—A L-O-U-D S-P-E-A-K-E-R

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SPECIALTY COMPANY

(Manufacturers)

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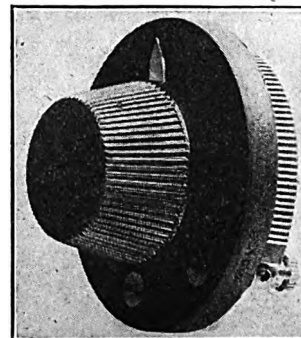
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DEALERS—JOBBER

We manufacture a complete line of Receiving Sets from a practical crystal set to a high quality loud speaker. Five different sets in all, enabling you to satisfy every demand.

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ARE NOW READY FOR DELIVERY.

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We can also supply you with a full line of tested accessories and parts. Write for prices and discounts.

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We carry a full line of Radio Goods
**Dictograph Head Sets, Vario
Couplers, Everett Head Sets,
Variometers, Transformers,
1700 Meter Loose Couplers,
Dials and Knobs.**

Send 50c for 20 Blue Print
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Radio Sets Made to Order
SUNBEAM ELECTRIC CO.
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Everything in Radio

To the dealer
from Parts to Complete Sets
**Immediate Deliveries
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THE WOLBRACK CO., Inc.
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2200-Ohm Head Phones

\$8 per pair list

Bring in Music Loud and Clear!

VARIABLE CONDENSERS

43-Plate, .001 mfd., list.....\$4.00

23-Plate, .0005 mfd., list.....\$3.25

Dealers write us for prices

RADIO DEPARTMENT**Signal Systems Service Co.**

1 East 42nd Street New York City

Radio Apparatus

Immediate Shipment from Stock

Frest Head Phones, 3,000-ohm..... \$8.00
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These are small compact instruments of the lattice type with no unnecessary frame work. Maximum efficiency, sharp tuning. Ideal for portable sets and for those who build their own because of easy accessibility.

3" Bakelite Dials with knobs..... \$.75
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These condensers are of the very highest quality. Fully guaranteed.

Macca Receiving Sets 2 stage amp.....\$110.00

Mail orders promptly filled.

Dealers write for our proposition

Complete Radio Equipment

Northern Radio Supply Corp.

542 West Washington Street

MAIN 2230-2231 CHICAGO, ILL.

**Government Examinations
for Radio Inspectors**

THE United States Civil Service Commission is conducting an open competitive examination for radio inspector. These examinations are being held in cities where an office of the commission is located. July 19 is the closing date.

Vacancies in the positions of radio inspector and assistant radio inspector in the Bureau of Navigation, Department of Commerce, at \$1,800 to \$2,200 a year, and in positions requiring similar qualifications at these or higher or lower salaries, will be filled from this examination, unless it is found in the interest of the service to fill any vacancy by reinstatement, transfer, or promotion.

Appointees whose services are satisfactory may be allowed the increase granted by Congress, of \$20 a month.

All citizens of the United States, from 21 to 50 years of age, who meet the requirements, both men and women, may enter this examination; appointing officers, however, have the legal right to specify the sex desired in requesting certification of eligibles. For these positions in the Bureau of Navigation, men are desired.

The duties of radio inspectors will be primarily to inspect the radio apparatus on steamships, to insure its compliance with the law, and to inspect shore stations. The inspectors may also be called on to examine radio operators. The duties of radio inspectors require some office experience, therefore competitors should outline fully in their applications any office experience they may have had.

The duties of assistant radio inspectors will be primarily the assisting of radio inspectors in the enforcement of the wireless communication laws. Assistant radio inspectors will be required to inspect the radio equipment on board vessels and in land stations, which involves the carrying of 30 or 40 pounds of testing and measuring instruments. The inspection work requires a knowledge of the installation and operation of the several types of radio installations, including the adjustment and tuning of transmitters and receivers.

Applicants must have received a bachelor of science degree from a school of recognized standing, such educational training to have included a special course in radio or kindred sciences, or show that they are senior students in such institutions; or have had the equivalent of a high-school education and at least two years' experience in special radio work, such as the manufacture, installation, or adjustment of commercial or governmental wireless apparatus. It is essential that applicants be wireless telegraph operators.

RADIO CABINETS

Manufactured
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A REAL VARIABLE

THE HAYNES VARIABLE CONDENSER was designed before it was built. IT DOES NOT LEAK. DEALERS—Here is a condenser worth twice its price, yet there is plenty in it for you. Write for particulars. We can make delivery.

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ATTENTION DEALERS!

Handle the B & C Variable
Condensers. Rugged, Efficient,
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Very Liberal Discounts.

**POTTSTOWN RADIO
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Radio Set Complete

Enjoy Daily Concerts, Weather Crop
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Complete Outfit \$12.75
Including 2,000-ohm Phones
Immediate Shipment.

Can be installed in 30 minutes
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Full instructions with each set.
Send check or money order to

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The Music Box Crystal Set is superior in design and tone to anything in the market..\$10.00

Post Phone Condenser..... .70

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Mail orders promptly filled
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KEYSTONE VARIABLE CONDENSERS

21 Plate
\$3.55

43 Plate
\$4.50

Our selection of materials and built-up type design give assurance of low energy loss and high efficiency.

Agents and Jobbers write for information

KEYSTONE MOTOR COMPANY
OAKS, MONTG. CO., PA.

Will Radio Bring a Universal Language?

A POWERFUL station near New York recently held conversation with a Cuban station. Two nations of different languages were thus connected. The official representatives of the radio interests of five great nations—United States, Great Britain, France, Italy and Germany—met in Paris to arrange for greater harmony in the developing field of radio. They decided that some international code or medium of communication must be selected. Europe, with her more than twenty-five languages, feels the need of an auxiliary for the radiophone in an international language. Even this country, with one language from the Arctic down to Mexico and Cuba, may find herself handicapped to the degree in which she fails to acquire a simplified tool of international communication. What shall it be? Partisans of Esperanto are urging the adoption of that language. A campaign is being planned in the interest of Latin, which has the distinction of being the only language that was ever international. Without some such medium, how can the persons in various countries who happen to be interested in relativity profit by the broadcasting of an Einstein lecture from Berlin at 2,097½ meters?—The "Evening Post," New York.

VARIOMETERS UNWIRED

Mahogany wood turned cup, white wood ball ready for wiring. Range 175 to 600 meters. Ready for immediate delivery in any quantity. Workmanship guaranteed.

SAMPLE SET, \$1.10

The Ever Ready Woodworking Co.
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Phone Orchard 5585

Watch Your Batteries

Some of the "frying" noises caused in the loud speaker originated from the B batteries. These should be watched very carefully, and if they give any trouble should be replaced. None of this trouble can be eliminated by placing a fixed condenser across the B battery. Such a condenser can be purchased in a flat, metal

container, and its capacity should be either 1 or 2 mfd.—New York "Tribune."

**GUARANTEED
RADIO SETS & ACCESSORIES
NORTHERN RADIO SUPPLY
CO., Inc.
14-16 Church Street, New York
Mail orders promptly attended to**

COMMUNICATE AT ONCE

BOOK YOUR ORDERS NOW

**Scientifically Designed Bakelite Variometer and
Variocoupler Combined Complete with Mounting**

Entirely New Type—Our Patent Is Pending

Price Only \$7.50—Discounts in Quantities

WIRE — WRITE — CALL

PAUL G. WEILLER, 320 Market Street, Newark, N. J.

Charles E. Hayes Co. *Wholesale Distributors of* **Radio and Electrical Supplies**

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Telephone: River 3515

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THE ANCHOR BRASS & ALUMINUM CO.

Ninth and Freeman Sts.

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RADIO WORLD'S QUICK-ACTION CLASSIFIED ADS

This department is intended for everybody who wants quick action on short announcements covering the buying, selling, exchanging or general merchandising in the radio field. Readers of RADIO WORLD will find that it pays to read these columns every week. Advertisers will get a ten-day service here—that is, copy received for this department will appear in RADIO WORLD on the news-stands ten days after copy reaching us.

The rate for this RADIO WORLD QUICK ACTION CLASSIFIED AD. DEPT. is 5c. per word (minimum of 10 words, including address), 10% discount for 4 consecutive insertions, 15% for 13 consecutive insertions (3 months). Changes will be made in standing classified ads., if copy is received at this office before 4 P. M. on any second Tuesday preceding date of publication. RADIO WORLD CO., 1493 Broadway, N. Y. C. (Phone, Bryant 4796.)

Mailing Lists—Canadian radio operators' addresses \$4 per 1,000. Atelier Trade Service, London, Ontario.

For Sale—Regenerative Receiver, Tubes, Batteries, Detector Two Step with Phones. Sell cheap. E. Schuessler, 2209 Wheeler St., Cincinnati, Ohio.

Sneeze Powder, greatest fun-maker on earth. Bottle 10c. Cliff Fenner, 2401 Jefferson, Louisville, Ky.

For Sale—Complete two-inch spark set. Mesco Coil, condenser, pancake helix, gap, key. \$10.00. F. W. Frost, Prospect Ave., Princeton, N. Y.

RADIO APPARATUS and SUPPLIES. Circular free. CONRAD RADIO COMPANY, 76 Boylston St., Jamaica Plain, 30, Mass.

WRITE for catalog showing complete line of Elmco Shielded Radio Apparatus, tuners, detectors, amplifiers, transformers and sockets. Electric Machine Corporation, Indianapolis, Indiana.

DEALERS and JOBBERS

Write for our attractive proposition. Shipments and satisfaction—not disappointments. Service unexcelled. Complete line. G. S. NYCUM, Manufacturer NYCO Radio Supplies, 507 Penwood Ave., Wilkinsburg, Pa.

Exchange jolly interesting letters through our Club! Stamp appreciated. Betty Lee, 4254 Broadway, New York City.

Enclose Self-addressed Envelope and receive free bulletin of various designs from which you may build your own Receiver from our blueprints. The blueprints show full constructional details, wiring diagram, bill of material and necessary data, and we guarantee the performance of the

model. Price of blueprints varies as to subject desired. Ask for bulletin No. 349. Experimenters' Information Service, 220 West 42nd St., New York City.

AGENTS WANTED in every city and town to sell standard radio apparatus. Attractive discounts given. If interested, write at once, stating age and radio experience. Wilmington Electrical Specialty Co., Inc., 912 Orange Street, Wilmington, Delaware.

PATENTS—Electrical cases our specialty. Pre-war charges. B. P. Fishburne, Registered Patent Lawyer, 386 McGill Bldg., Washington, D. C.

GOOD TERRITORY STILL OPEN FOR LIVE DEALERS TO HANDLE OUR COMPLETE LINE OF RADIO INSTRUMENTS

Special Broadcasting Receiving Sets, Crystal and Audion, Radio, Audio Frequency and Power Amplifiers, Loud Speakers and complete line of parts. Complete details on request. LEE RADIO CORPORATION, HADDONFIELD, NEW JERSEY.

Crystal Set That Gets Radio Concerts. Build it right, boys. Plans and full instructions for building at low cost, high grade fine adjustable Crystal Receiving Set, fifty cents postpaid. Dept. R. D. Shaw Mfg. Co., Galesburg, Kan.

RADIO CABINETS—With all good tone chambers, with or without phonograph combination. Any quantity in stock sizes or in order. Columbia Mantel Co., 175 Powers Street, Brooklyn, N. Y. Tel. Stagg 2726.

Radio Memory Course, in 20 minutes. Lengthy study unnecessary. Learn Code, Alphabet and numerals in practically one reading. Send 25 cents. Mervyn Sales Co., 850 Penobscot Bldg., Detroit, Mich.

VENTRILOQUISM taught almost anyone at home. Small cost. Send 2c. stamp today for particulars and proof. Geo. W. Smith, Room M, 125 N. Jefferson, Peoria, Illinois.

TYPE R-3 MAGNAVOX TYPE R-2

We can make immediate delivery on a limited supply of Type R-3 Magnavox, \$45.00, 14" Horn, and Type R-2, 18" Horn, \$85.00. Dealers and agents, discount 10% on 1, 15% on 2 or more. C. O. D. or cash with order. THE KEHLER RADIO LABORATORIES, Abilene, Kansas, Dept. W.

RADIO DEALERS AND AMATEURS

DON'T BUY until you have investigated our line of Radio Instruments BECAUSE radio apparatus requires scientific knowledge and mechanical skill in the design and manufacture. Our experts have embodied these in our Special Broadcasting Receiving Sets, Audio, Radio-Frequency and Power Amplifiers, Loud Speakers and complete line of parts manufactured by us. LEE RADIO CORPORATION, HADDONFIELD, NEW JERSEY.

\$1.00 COMBINATIONS—BY MAIL, \$1.09

No. 1—100 ft. No. 14 antenna wire; 20 ft. No. 14 insulated ground wire, 1 ground clamp (solid copper); 1 single pole double throw lightning switch. No. 2—1 8 by 3/4 inch insulated tube, wound with enameled wire; 2 slides and 2 brass rods to fit; 4 nickelplated brass binding posts. No. 3—2 60c. switch-levers (1 1/2 inch); 20 contact points with nuts; 4 stops, 4 binding posts, 1 detector stand (unmounted). No. 4—1 set of 4 radio tubes, 8 inches long by 3-3/4—4-1/4 dia.; one spool No. 24 cotton covered wire, 375 feet; one wood rotor. Enclose Money Order or Checks, but no stamps. Brilliantone Radio Products, 874 Columbus Ave., at 103rd St., New York.

DEALERS

Have you our price list?
Drop us a line
Everything for radio

RADIO ACCESSORIES CO.
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ANNOUNCING

STANRAD ADAPTER

for the RAC3-Meyers-tube. Enables the Amateur to use the above tube in the standard socket. Price \$1.25 P.P.

Orders filled in order received.

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RADIO WILL MAKE YOU MONEY

Well known established concern manufacturing WIRELESS specialties offers investors an opportunity to participate in big profits to be made in the WIRELESS INDUSTRY EXPANDING BUSINESS. Not a promotion.

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Radio a Public Utility

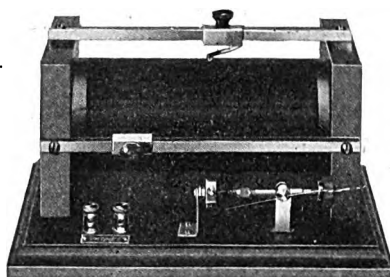
Many people are raising the question as to who will maintain radiophone broadcasting stations in the future, says "Radio," San Francisco. The answer is found in the recommendation of the Washington Radio Conference "that radio communication is a public utility," and in the fact that definite bands of wave-lengths have been set aside for broadcasting from government stations and public institutions. The broadcasting of information of all kinds will soon become as much of a public necessity as are good roads.

Fifty-two issues for \$6.00. Sub. Department, Radio World, 1493 Broadway, N. Y. C.

THE B-K RECEIVER

PRICE \$8.50

with pair 2200 ohm phones \$15.00



No Crystals furnished with this set. Woodwork solid mahogany, highly polished. All metal parts nickel plated. Conservative phone range 25 to 30 miles with proper antenna. Write for bulletin No. 1.

Dealers write us regarding above receiver, also our vario-couplers and variometers.

BONDUAUX & KNIGHTS
1115 Kelly Street Bronx, N. Y.

"ARROW"

Knockdown variometers ready for winding. 2 mahogany stators 1 1/4"x4 3/4"—mahogany rotor—3 3/4". Winding form and brass hardware complete. Shipped freight prepaid \$1.65.

Cash or Money Order

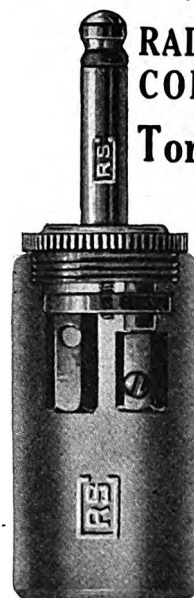
ARROW WIRE COMPANY

Radio Department
557 WEST 35th STREET, NEW YORK CITY

Subscribe for RADIO WORLD. \$6.00 a year, \$3.00 six months, \$1.50 three months.

RADIO STORES CORPORATION Torpedo Plug

LIST, \$1.25



All conductive parts are of heavy machined brass, insulated throughout. Screw binding post terminals.

Handle is of light, strong insulating material.

Designed to secure rigidity and durability. Each plug packed in an attractive carton.

Pat. Pending

Manufactured by

Radio Stores Corporation

National Distributors and Manufacturers
218-222 West 34th St. New York City

Table of Magnet Wires for Winding

By Frederick J. Rumford, R. E.

The number of feet contained in each pound of magnet wire, of all sizes ranging from No. 20 to 40, is given in the appended table.

The beginner, amateur or experimenter will find this table useful when computing the necessary amount of magnet wire needed for a coil of a known diameter or length. The table will be found useful in other ways:

B & S Gauge	Single-wound cotton	Double-wound cotton	Single-wound cotton	Double-wound cotton	Enameled
20	311	298	319	312	320
21	389	370	398	389	404
22	491	461	504	493	509
23	624	584	645	631	642
24	778	745	795	779	810
25	958	903	1004	966	1019
26	1188	1118	1240	1202	1286
27	1533	1422	1615	1542	1620
28	1903	1759	2023	1917	2042
29	2461	2207	2625	2485	2570
30	2893	2534	3335	2909	3240
31	3483	2768	3820	3683	4082
32	4414	3137	4876	4654	5132
33	5688	4697	6243	5689	6445
34	6400	6168	7757	7111	8093
35	8393	6737	9660	8534	10197
36	9846	7877	11907	10039	12813
37	11636	9309	13474	10666	16110
38	13848	10666	16516	14222	20274
39	18286	11907	22261	16516	25519
40	24381	14222	26947	21333	32107

The above gives the correct number of feet of magnet wire per pound for various sizes and coverings. To get $\frac{1}{8}$, $\frac{1}{4}$, or $\frac{1}{2}$ pound amounts it will be necessary to divide the fraction or the whole by the fraction thereof.

R K M for This Week

By Roy K. Moulton, the famous humorist of "The Evening Mail," New York. Copyrighted by Mail and Express Company.

7.10 p.m.—Recovering golf balls by Laddie Boy, the White House Airedale.

7.28—Airplane flight by Congressman Manuel Herrick of Oklahoma, who hates to get his name in the papers.

7.47—Gunfight between Izzy Einstein and a Brooklyn saloon keeper.

7.56—Steeplejack climbing flagpole on the Equitable Building.

8.01—Governor Nathan Miller declining renomination for governorship. (Exclusive showing.)

8.43—Warren and Helen in breakfast table chat. Helen hits Warren for two bucks and Warren hits Helen with the coffee percolator. Happy home stuff. Great for the children.

8.59—Materialization of dinosauri and other prehistoric animal spooks by Dr. A. Doyle Cone.

9.17—Rudolpho Valentino and Gloria Swanson in wrestling scene from famous love fillum. Very exciting. No bigamy in this exhibition.

9.37—Modeling in clay by Dardanella La Rue of Greenwich Village.

10.00—Correct time from George Ehret's brewery, where they have nothing but time.

10.00 to 11.00—Ice skating by Charlotte.

11.00—Good night.

"SPAGHETTI"

VARNISHED TUBING

"EVERYTHING IN INSULATION"
VARNISHES, COMPOUNDS, PAPERS, ETC.

MITCHELL-RAND MFG. CO.
24 VESEY ST., NEW YORK, N. Y.

PHANTOM ANTENNA

Reduces static, eliminates lightning arrester and unsightly outside aerial. Ideal for apartments and city users who cannot erect aerial.

Fine oak cabinet and nickel fittings with green silk cord and plug ready to attach to nearest lamp socket. Price postpaid \$5.00. Dealers and jobbers wanted.

A. C. PENFIELD

Conneautville, Pa.

—NACO—

Radio Receiving Sets

\$20.00

Scientifically built to insure dependable service under exacting conditions with which radio communication has to meet. For clear hearing and pleasing tone use a Naco set.

Naco Radio Accessories

Telephones, Knock-Down Sets, Condensers, Coils, Detectors, etc.

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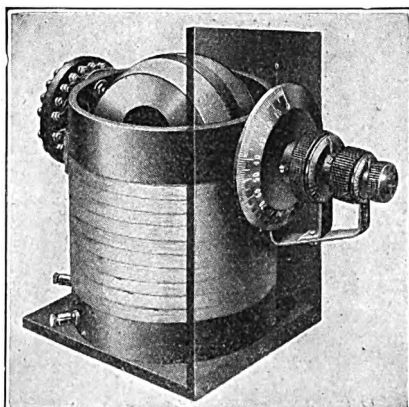
National Motor Accessories Corp.,
47 Vesey Street, New York City

SELECTOR—VARIO—COUPLER

Three units
in one.

Self-contained.

Minimum
static
disturbance.



Space Saver.

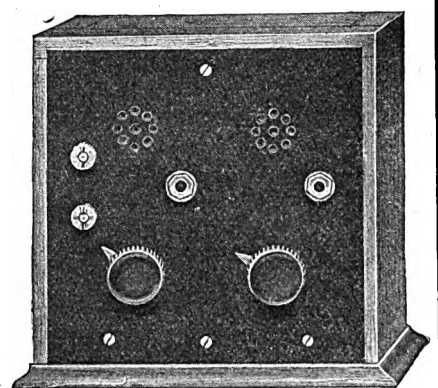
Neat,
Compact
and
Efficient.

Send for
Circular.

NORRIS RADIO CORPORATION

Dept. 46

126 LIBERTY STREET, NEW YORK CITY



Have you Radio worries? Weak signals—blurred music—distorted loud—speaking? You will want our B-2 two stage amplifier which increases music or signals from any Detector set mounted on Bakelite-Oak Cabinet. By money order **\$37.50**

Beacon Radio & Electric Co.
246 Greenwich Street, New York City

Latest broadcasting map 15c. That is, a complete broadcasting map appeared in Radio World, No. 8, dated May 20. Mailed on receipt of 15c. Radio World Company, 1493 Broadway, N. Y. C.

Eventually—

CLARION CLEARTONE* HEADPHONES

FOR EFFICIENT RADIO RECEPTION

*Designed
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CASE—
Highly polished
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CAP—
Highly polished
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CORD—
Six foot long.

HEAD BAND—
Popular Navy Type

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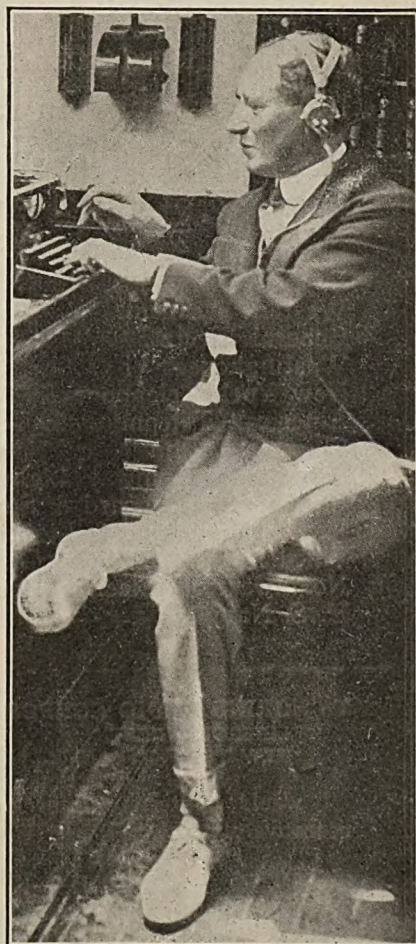
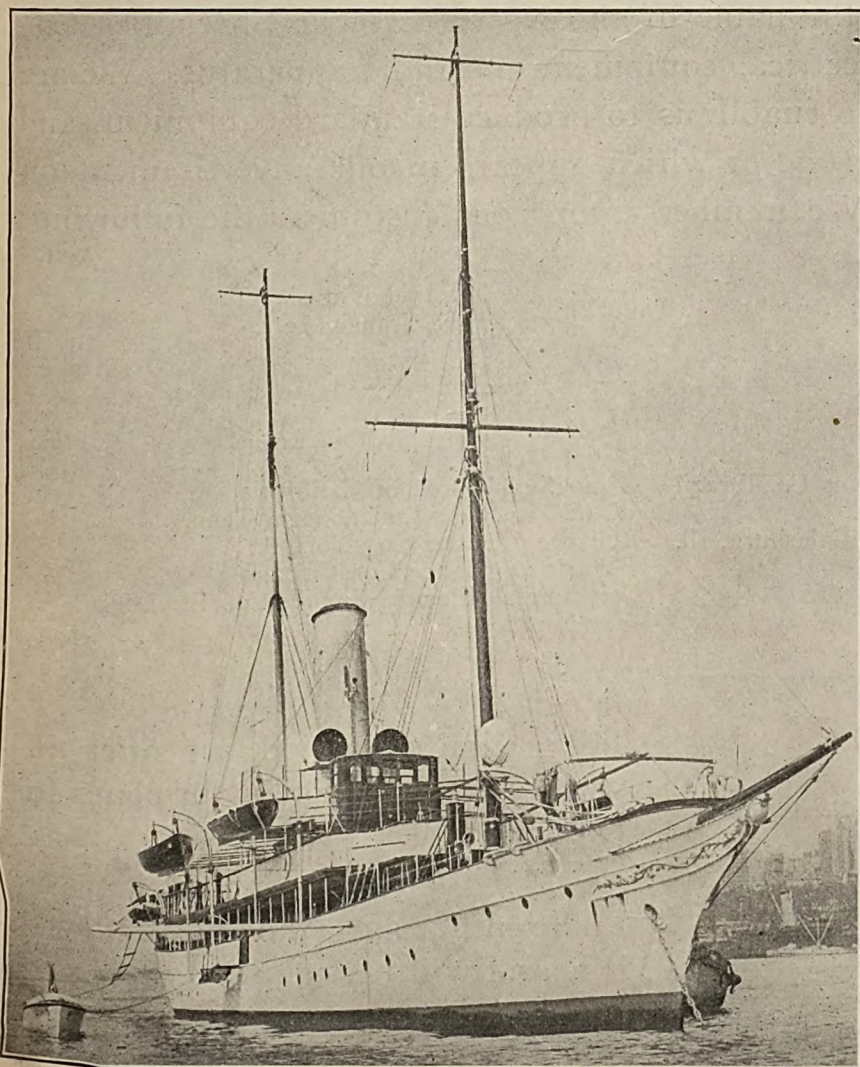
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RADIO WORLD

Entered as second-class matter, March 28, 1922, at the post office at New York, New York, under the act of March 3, 1879

I L L U S T R A T E D

Marconi Thrills America with New Radio Feat



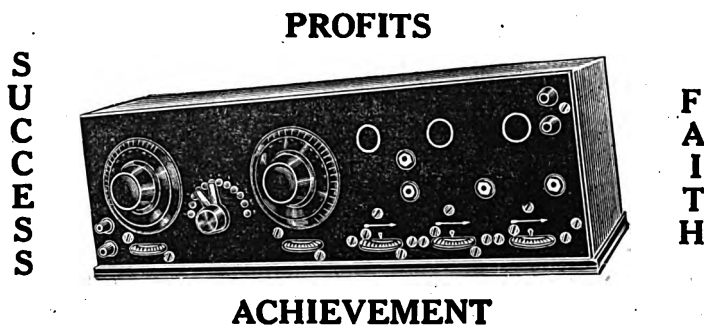
Marconi in the radio office of his yacht "Electra," aboard which he arrived in New York a few days ago. The yacht is shown at left.

(C. A. & P. Photos.)

(SEE PAGE 12)

Important to Fans! "How to Use a Condenser"

PROGRESS SURROUNDS RADIO TO-DAY



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RADIO WORLD

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Vol. 1, No. 14

July 1, 1922

15c. per copy, \$6.00 a year

General Pershing Honors Inventor of Undersea Radio



(C. Underwood & Underwood, N. Y.)

In honor of his services to military and naval science, General Pershing and his staff recently visited Dr. J. Harris Rogers, inventor of underground and undersea radio, at his laboratory at Hyattsville, Maryland. From left to right: Dr. J. Harris Rogers, Miss Cornelia Clark, Dr. J. Clarence Owens (standing), General Pershing, Colonel Major, General Pershing's aide.

Army Shares Arlington Station

THROUGH the cooperation of the Naval Communications Service, the Radio Section of the Signal Corps has acquired the use of part of the big Arlington Station for its chief sending station at Washington, D. C. Two sets will be used by the Army exclusively; one tube set with 10 k.w., in the antenna and another with 20 k.w., in the antenna. The latter, used on about 3,000 water-waves, should carry as far west as Omaha. To-day, the Signal Corps is using a two k.w., transmitting set at Arlington for regular traffic on 2650 meters, controlled from the radio headquarters in the Munitions Building.

The government has saved at least

\$50,000 by combining the Naval and Army sending stations at Arlington, as the Signal Corps station planned for the Washington Barracks would have cost practically that much when the permanent installation was completed. Now the temporary station at the Barracks has

**Radio will be man's greatest
help within a very few years.—**

Prof. J. A. Fleming, of London.

been abandoned, and the permanent construction saved.

The Navy will still continue to operate from its station at Arlington, using its own sets as previously, but has arranged to lend the Army radio section its big 100 k.w., spark set when necessary, as well as its arc set. Another combination has made possible the operation of the Navy 1 k.w., tube-set at Arlington by either the Naval Air Station at Anacostia or the Army Bolling Field for the transmission of messages to planes or short distances up to 250 miles. These stations will also conduct considerable meteorological work with the 1 k.w. set at Arlington.

T.T.F.A.

Novel Unit-Detector and Amplifier

By Frederick J. Rumford,
A. M. A. I. E. E.

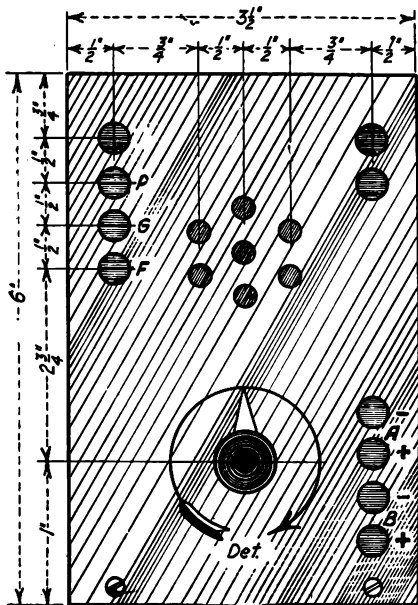


Figure 1—Front view of the detector unit-panel with necessary dimensions. Suggested by F. J. Rumford. Drawn by S. Newman.

I PROPOSE to describe in this article, as non-technically as possible, the building of unit detector and amplifier panel, which may be made up at cost of less than \$40. This outfit has proven to be very efficient in operation. The result should be a high-class instrument, both in appearance and ability to serve its purpose.

As will be noted, this outfit may be made up just as a detector panel. Or, either as a one- or two-stage amplifier it may be used later in conjunction with the detector panel. Its cost is nominal. As will be noted also, the wiring is very simple and is accessible

at all times for any internal changes of hook-up or for the changing of a vacuum tube or amplifying transformer. The writer knows the builder of one of these units who has mounted each individual unit in a cabinet of its own, the cabinet having a hinged cabinet for access to its inner parts.

For years I have been experimenting with all kinds of radio and electrical instruments, and used many and varied

kinds of hook-ups. At the present time I am looking for an amplifier which I may consider perfection.

So far I have found this one to be as near perfect as any in my experience. And I am certain that any instrument I describe will work as I claim, provided the directions are faithfully followed.

Figure 1 shows the front view of the detector unit-panel with its necessary dimensions. Figure 2 shows the front view of a two-amplifier panel-unit, which also shows the position of jacks and rheostats with respective dimensions. Figure 3 shows the end view of the amplifier unit showing the method of mounting the jack, and amplifying transformer, and the vacuum-tube sockets; it also shows the proper dimensions. I have omitted showing an end view of the detector unit-panel, as in all respects it is like the amplifier unit-panel with but one difference: it has no amplifying transformer mounted on its base, but, in place of the transformer, it has a grid leak and grid condenser, combined, mounted. Figure 4 shows the method of hooking up the detector unit-panel and the amplifier unit-panel internally and externally, particular attention being paid to the method of hooking up in the detector panel, as the vacuum tube used in this instance is radiotron UV-200, which carries a plate voltage at the highest of 22 1/2 volts and the amplifier panel tubes, which, in this instance, are two

(Continued on next page)

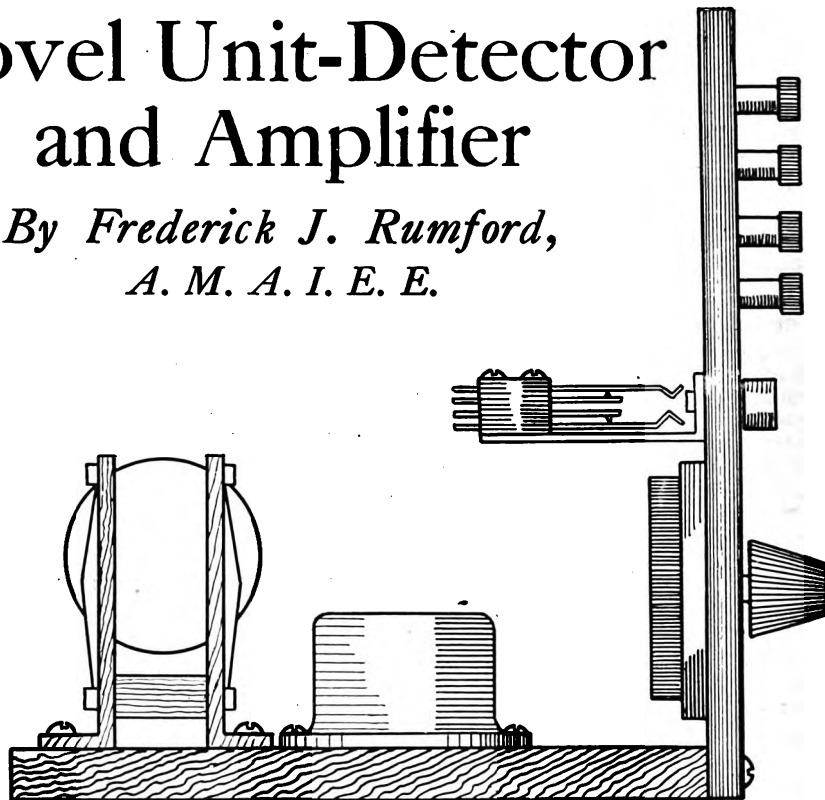


Figure 3—End view of the amplifier unit showing the method of mounting the transformer, jacks and sockets. Suggested by F. J. Rumford. Drawn by S. Newman.

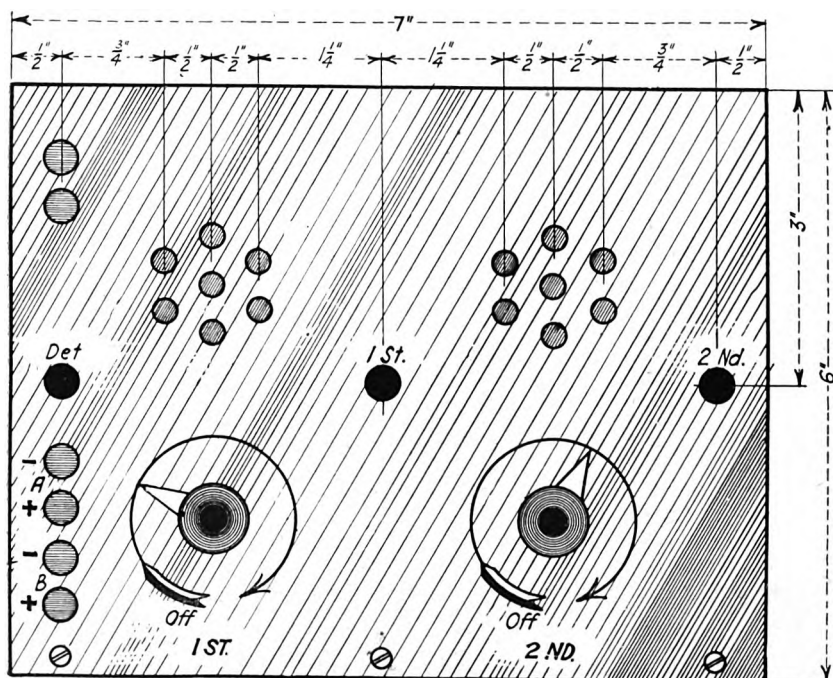


Figure 2—Front view of a two-stage amplifier panel-unit with dimensions. Suggested by F. J. Rumford. Drawn by S. Newman.

(Continued from preceding page)
radiotron tubes, UV-201, which have a plate voltage at the highest of 45 volts.

Under no circumstances must 45 volts be applied to the detector tube as it would not function properly. The detector and the two-amplifier tubes have each a filament voltage of from 4 to 6 volts.

Following is listed the various articles, with their respective prices, for the detector:

1 formica panel 6x3½x¼ in.	\$.63
1 Fada rheostat.....	1.00
10 binding posts..... @ .10	1.00
1 vacuum-tube socket.....	.75
1 base 5x3½x¾ in.....	.10
1 grid condenser and grid leak accessories.....	1.20
1 Radiotron UV-200 vacuum-tube detector.....	5.00

Total \$9.68

This cost includes the vacuum tube. No doubt you are aware that in buying a detector panel-tube, at a cost of at least \$8 to \$10, the vacuum tube is omitted. It is purchased separately. Compared with the above figures, it should encourage every reader to build himself at least the detector unit, even if he does not desire to build the amplifier unit at the present.

In the following the necessary parts and their respective costs for the amplifier unit-panel are listed:

1 formica panel 7x6x½ in.....	\$1.26
2 Fada rheostats.....@ 1.00	2.00
2 Frost two-circuit jacks.....@ .90	1.80
1 open circuit Frost jack.....	.75
6 binding posts.....@ .10	.60
2 vacuum tube sockets.....@ .75	1.50
2 Clapp-Eastham amplifying transformers.....@ 4.00	8.00
1 Frost plug.....	1.00
1 base 7x5x¾ in.....	.25
Accessories.....	.30
2 Radiotron UV-201 vacuum tubes.....@ 6.50	13.00

Total \$30.46

The total cost, therefore, for the detector control-unit panel and the amplifier unit-control panel is \$40.14, which includes the three vacuum tubes.

For the actual construction: First, both panels must be marked up and drilled. I have not specified the size of holes or drills to be used, as in many cases the builder requires parts of larger or smaller shafts or screws, so the size is left to the builder's own judgment. After the drilling has been finished, the panels should now be rubbed with No. 0 sand paper and fine or light machine oil, which will give the panels a nice finish. In many instances, the panel when purchased is finished. If such is the case, leave well enough alone. Next, the binding posts, rheostats, and other necessary impediments should be mounted, and the panels should be mounted on their respective bases by means of two wood screws.

After the panels have been mounted, as shown in Figure 3, the vacuum-tube sockets should be mounted upon their

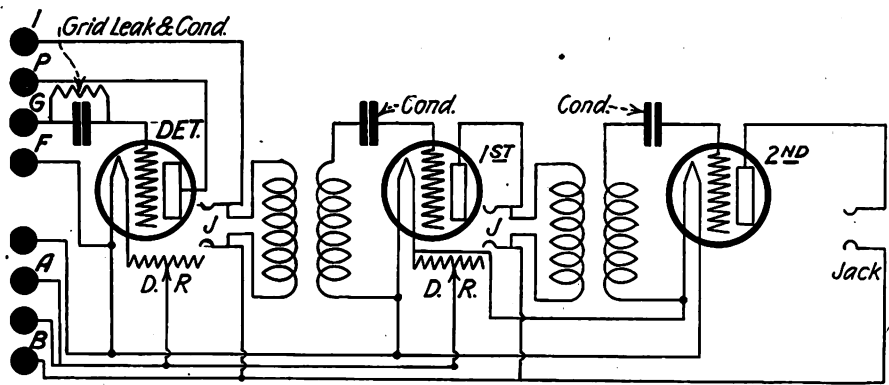


Figure 4—Schematic diagram of the hook-up is shown. Suggested by F. J. Rumford. Drawn by S. Newman.

bases; but, of course, on the amplifier unit the simplifying transformers are mounted on the base, as also shown in Figure 3; and on the detector unit, the grid leak and the grid condenser must be mounted on the base. Just a word of advice: It is well to shellac the bases before mounting the panel.

The entire outfit is now ready for wiring on the detector unit:

A wire is run from the negative of the A battery binding post to one of the binding posts marked F on the vacuum-tube socket. Another wire is run from the positive of the A battery to the arm of the rheostat; another wire connects from the remaining post of the rheostat to the other post, marked F, on the vacuum-tube socket; another wire runs to the binding post on the panel, marked F, to the wire just connected with the remaining post, marked F, on the vacuum-tube socket. There is a wire connecting with the post on the vacuum-tube socket, marked G, to one of the posts on the grid leak or grid condenser. Another wire connects with the remaining post of the grid leak to the binding post, marked G, upon the panel. Another wire is connected with the post on the vacuum-tube socket marked P, which, in turn, connects with the post, marked P, on the panel. Another wire which connects with the post, marked I, to the post, marked I, on the other side of the panel, and there is a remaining wire which connects with the binding post marked positive, of the B battery, to the post, marked 2, on the panel.

I will now follow with the internal wiring of the amplifier unit. A wire connects with the binding post, marked negative, of the A battery and runs across the lower section of the panel with two intersecting wires connecting off either and running to each side of the filament vacuum-tube socket. From this wire, which has already been connected, there is a wire running and connecting to one of the secondary binding-posts of the amplifier transformer on each. The other side of the remaining binding post—of the second of the transformer—connects each to

the post, marked G, on the vacuum-tube socket. A wire connects from the positive binding post of the A battery, which, in turn, connects to each of the arms of the rheostat. The remaining binding posts on both the remaining rheostats connect to the posts, marked F, on the vacuum-tube sockets. From the binding posts, marked 1, on the upper left-hand corner of the panel, a wire connects to the top blade of the jack; from the binding post, marked 2, on the upper left-hand corner of the panel, a wire connects to the lower blade of the jack; from the two inner blades of the jack wires connect respectively to the both posts of the primary of the amplifier transformer.

There are also wires that run from the positive of the B battery binding-posts across and connect respectively to the lower blades of the two remaining jacks. From the first amplifier vacuum-tube socket and the post, marked P, a wire connects to the upper blade of the second jack. The two inner blades connect with the primary of the second amplifier transformer; from the blade of the second amplifier tube to the upper blade of the remaining jack, a wire is also run. The wires must be bent and built to position, using rigid wiring of No. 18 enameled wire. There is a jumper wire that runs from the negative of the B battery to the positive of the A battery on the detector panel unit.

The above wiring is not as complicated as it may seem at first sight. It is all clearly shown in the diagrams. It is understood, also, that the receiving set should be correctly connected in with the aerial and ground.

Procedure: Light the filament of the vacuum tube by switching on the rheostat. The plug is then inserted in the first jack. The rheostat of the vacuum-tube detector is then manipulated until the point of oscillation is reached, which may be detected by a pronounced hissing heard in the phones. The hissing should be reduced to a minimum. Now, the plug is inserted in the third jack, for louder signals using the same procedure.

Why You Must Use a Condenser

Possibly No Other Individual Piece of Apparatus in Radio Circuits Has So Many Varied Uses as the Condenser; and in All Probability It is the Least Understood by the Average Amateur of Any Element in the Receiver

By C. J. Williams

THE condenser is divided into distinct types, with a specific purpose, the fixed condenser and the variable condenser. In receiving circuits, the fixed condenser invariably consists of successive layers of tinfoil and specially prepared wax-paper. These fixed condensers are said to have a certain capacity. This capacity is generally calculated in microfarads—the farad being too large for radio work. The fixed condenser which is shunted across the phones, will have the effect of taking the weak electric impulses which have been rectified by the detector and store them up in this same condenser. After the condenser is fully charged, it discharges them more evenly into the telephone receiver. This will have the effect of increasing the signal audibility, which is always desirable. The tin foil forms the plates of the condenser, and the paper is the dielectric or insulating material. Other dielectrics may be used as that of mica, glass, or non-insulating oiled paper.

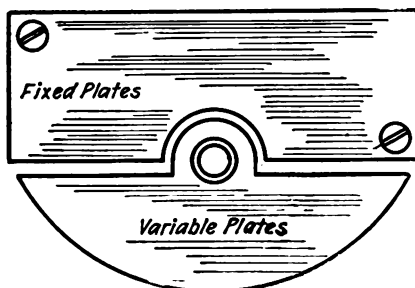
The variable type of condenser consists of two sets of metal plates, which, in the majority of cases consists of sheet aluminum or sheet brass, so arranged that one set of plates are stationary and the other set movable. By movable, we mean one set of plates moves inside the other set of plates—so we can have “all in,” or “all out.” The dielectric used in this type of condenser, usually consists of air. In former years, gone by, these so-called air condensers were made according to the above description, but came in an aluminum case. Now if castor oil were poured into the case so as to cover the plates, various capacities could be had. But now that everything must look classy on a panel, castor oil must take a long walk.

From this it will be seen that, since the capacity of the condenser depends upon the area of the plates, as well as the thickness and nature of the dielectric, rating a condenser simply by the number of plates it contains is not a true indication of the value in the circuit. The only indication that can be correctly obtained is by the actual size of the plates themselves. Variable condensers are used in the oscillating circuits of a radio receiver, or, to put it in another way, in the wireless cir-

cuits of the apparatus. They are made variable in order that the amount of capacity in these circuits can be adjusted so that the circuit itself may be placed into resonance with the wave length of the incoming signals.

The condenser has a very peculiar property. It can be charged up and discharged. When the current is applied to the circuit in which a condenser is placed the condenser will store up a charge of electricity on its dielectric up to the limit of its capacity. In the case of direct current, the current will flow up to the time that the condenser is charged, after which there will be no further passage of the current.

With alternating current, however, we have a different situation entirely. The current first of all charges the condenser with positive electricity, and immediately reverses this charge with the alternation of the current itself. Consequently the condenser offers a free path for the passage of alternating currents. The facility with which these



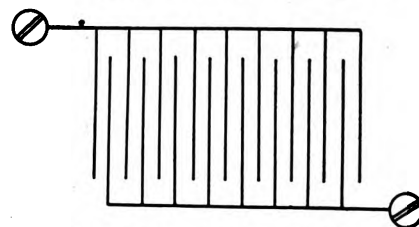
How the plates of a variable condenser are assembled. Note the different units marked “Fixed” and “Variable.” Suggested by C. J. Williams. Drawn By S. Newman.

currents will pass through a condenser depends entirely on the frequency, the more easily will the currents pass through the condenser

The variable condenser is used in the antenna or ground circuit, in shunt or across the primary of the tuner or variocoupler and in shunt or across the secondary of the tuner or variocoupler. Now that we know a little about condensers it is known that experimenters have become so accustomed to buying apparatus of a certain make that they want a condenser of, say, .001 microfarads capacity, they at once think of a condenser having 43 plates. Likewise

they think a condenser having 23 must have a capacity of about .0005 microfarads. This idea is all wrong and wants to be forgotten, for there are several factors that determine condenser capacity besides the number of plates.

The determining factors governing the amount of capacity in the condenser depends upon the area of the plates themselves, the nature and thickness of the dielectric between them. The capacity of a condenser will depend on the distances which separates the different plates from each other. This can be clearly seen when it is pointed out that the closer the plates are together, the thinner the volume of air



Sectional view of a variable condenser, showing how fixed and variable plates are arranged. Suggested by C. J. Williams. Drawn by S. Newman.

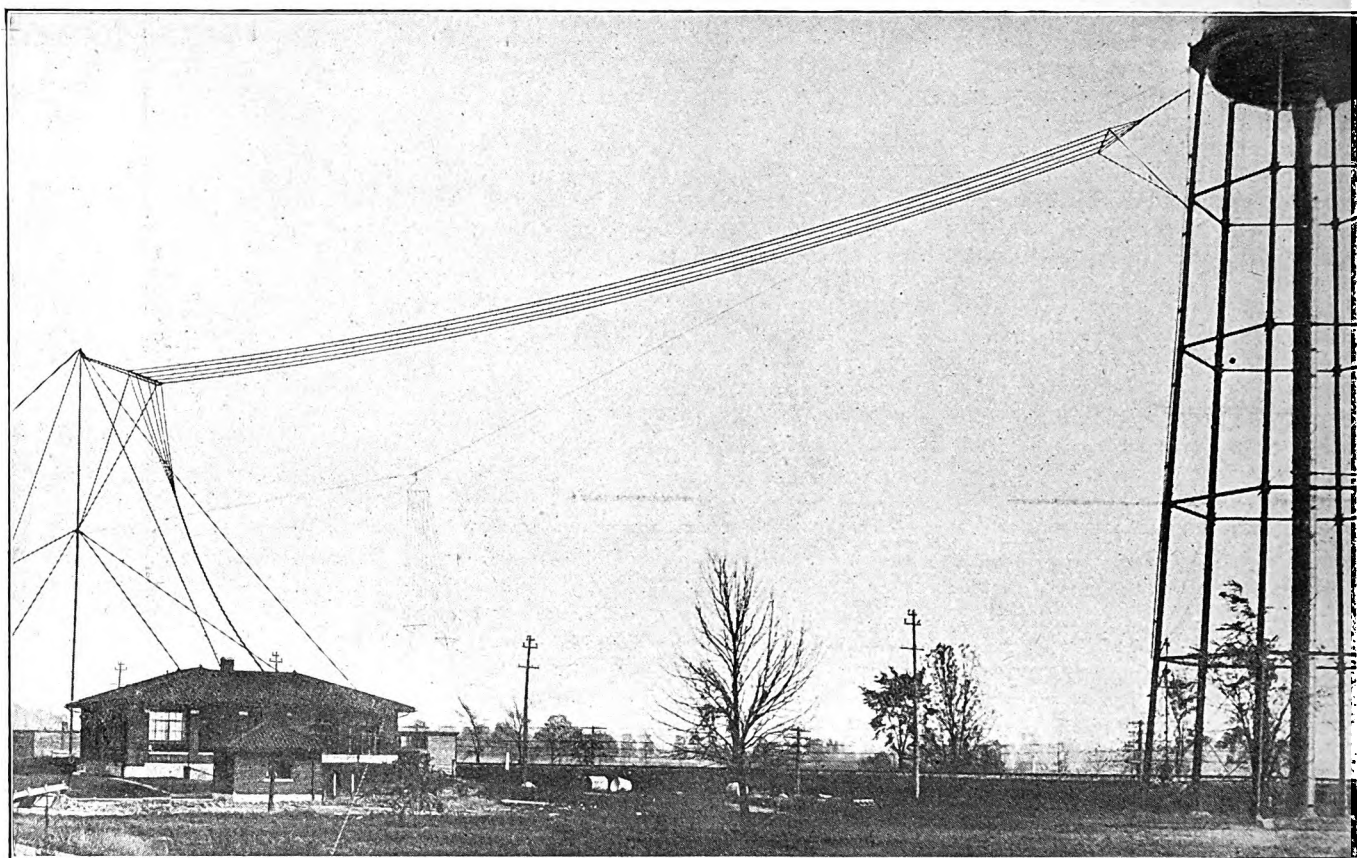
between them; and consequently the greater will be the capacity of the condenser, correspondingly, the further apart the plates are, the lower will be the capacity.

Dielectrics have what is known as an inductive value or dielectric constant, and this value is calculated by the relationship of the capacity values of the different dielectrics to that of air at ordinary pressure, which is considered as having a value of 1. On this basis a dielectric of paraffined paper would make a condenser having a capacity 3.65 times of air; mica would make a capacity of from 4 to 8 times that of air; hard rubber that of about 2.5 times of air.

We are dealing with frequencies in excess of 45,000 cycles per second so far as wireless is concerned. It will be seen, therefore, that a condenser is thereby enabled to perform a very important function in the wireless circuit, as it offers a very easy path to the passage of these currents. This is particularly important when it is taken into consideration that the inductance in the oscillating circuit has the same property, electrically speaking, as the momentum and inertia in mechanics. In other words, the inductance in an electrical circuit tends to resist any change in the direction and flow of a current, while the condenser assists the change. Keep these thoughts in mind and choose by the capacity rating instead of by the number of plates.

Henry Ford's Up-to-Date Station

By Edward J. Beck



The Ford radio station, WWI, at Dearborn, Michigan. This station operates on a wave length of 500 meters. The antennae are a large inverted L and two smaller aeriels. This makes long-wave reception possible with the large aerial. With the smaller ones, interference from neighboring stations can be practically eliminated.

FOR two years, Henry Ford has maintained a series of radio stations to transmit communications between his plants. Long before the general public was aware of the practicability of the wireless telephone the famous manufacturer had experimented with radio. The results were so satisfactory that five stations were established, four of which are still in operation. The plant at River Rouge, Detroit, where tractors are made and heavy castings for Ford cars, has been discontinued.

The Ford radio stations are located at Dearborn, Michigan, KDEN; Springfield, Ohio, WNA; Flat Rock, Michigan, WFD; and Northville, Michigan, KDEP. The Dearborn station is also licensed for broadcasting under the designation WWI, and as an experimental station under the name 8XD. The latter license entitles the Dearborn unit to send out messages over a wide series of wave lengths.

At Springfield, Ohio, are located the subheadquarters of the Ford railroad—the Detroit, Toledo & Ironton. During the first month this radio station was operated, in 1920, 4,000 messages

were transmitted between Springfield and Dearborn, the capital of the Ford industrial dominions.

Radio has come out as winner in an efficiency competition with the telegraph and the long-distance telephone. In the early days, wireless telephoning was the method used. Experience indicated that executives were inclined to be long-winded when they talked. So it was decided that messages should be sent in code in order to save time.

"By using code we are able to send thirty words a minute," said C. R. Voorhees, in charge of the radio department. "When an executive writes out his messages he is more concise and we are able to handle a much larger volume than is possible when he talks direct. As it is, our Springfield and Dearborn units are busy from seven forty-five in the morning until five fifteen at night."

In March, Michigan was visited with a sleet storm that almost completely interrupted telephone service for a week. The Ford plant at Northville, a small town thirty miles from Detroit, could not be reached by telephone. But no inconvenience was caused by this fact

because uninterrupted communication was maintained by wireless.

One of Mr. Ford's most cherished plans is to develop small water-power projects in rural communities to give employment to dwellers in small towns and stop the drift of population toward the cities. He is constantly adding to his holdings water-power sites on which plants may be located to manufacture the smaller parts of his cars and tractors. The two plants, at Flat Rock and Northville, are examples of such developments. As such plants are made ready, it is the intention to link them with Ford headquarters at Dearborn and Highland Park by radio.

At the Northville plant, one of the office employees functions as radio operator in addition to his other duties. The Dearborn radio unit employs four operators.

The Ford railroad, the D. T. & I., extends from Detroit to Southern Ohio. Messages are now sent from points on the Ohio River to Springfield over wires, thence by air to Dearborn, where they are again made to travel over wires into the telegraph room of the Highland Park plant. In

How Wave Lengths Travel

By Fred. Chas. Ehlert

SOUND waves, water waves, and radio waves travel at greatly different or varying rates per second. However, it is known that sound waves travel 1,100 feet a second, or 330 meters. Radio waves travel at the same speed as light—186,000 miles a second, or 300,000,000 meters.

But what are radio waves? Every one is familiar with water waves. The first thing we notice about a wave is its height and, of course, waves depend on the wind to create the height they are able to attain. The stronger the wind the greater the height. The correct way to measure the height of a wave is to secure the distance from the surface of the water to the crest—if such a thing is possible.

The amount of energy transmitted by water waves depends on the height of the ripple crests. This is also true of all other kinds of waves; therefore, the principle may be applied to radio waves. A better term for such measurement is called the "amplitude of the wave." The amplitude of the wave is the displacement between the trough (bottom) and the crest (top). Thus

we may say that the energy in wave motion depends on the amplitude. In order to have a wave, it is evident that there must be some material to carry the wave.

The element in which the wave travels is called the medium; the medium that carries water waves is water.

Battery Needs Every Care

THE storage battery cannot be disregarded for any length of time without suffering a reaction. The necessity of replenishing the individual cells with distilled water more frequently than usual during the summer months, is due to the fact that evaporation of the water is much more rapid, obviously the effect of the hot weather. Fans who operate their sets the year round, will now find it necessary to add distilled water about once a week instead of every two or three weeks.

There is nothing in the world that can rob radio of its popularity with the people. It is here to stay.
—Marconi.

Sound, therefore, is carried by waves in the air. Radio waves are carried by ether. If we watched the water waves we would soon notice that, besides the height, the waves have length also. There is, naturally, a certain distance from one wave to another. The distance is measured from the highest crest of one wave to the highest crest of the next wave. The distance is the length of the wave. A wave length is the distance from any part of one wave to the corresponding part of the next wave. It is the motion caused by these waves, as they move, or spread, that carries sound. A radio wave, reduced to its simplest meaning, is a vibration through space. A tuning fork is one of the best illustrations of vibration. The sound produced is caused by the speed, or frequency, of vibration—500 a second will produce a low hum; but the vibrations, if increased in frequency, will become so "high" that the human ear cannot hear them. In such a state, they will have gone out of the range of audio frequency, and become what we call sound waves or radio frequency.

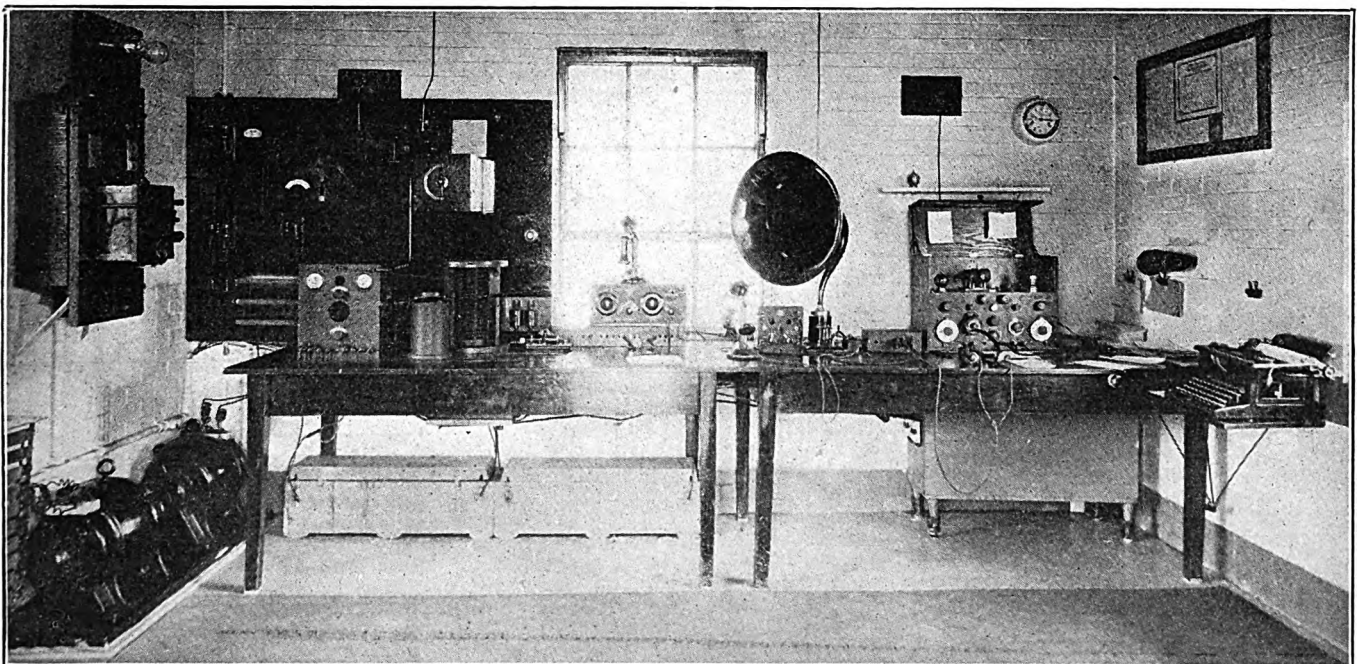
(Continued from preceding page)
this way, an operator presses his key at a telegraph office in Southern Ohio, another operator in Highland Park gets the message with an ordinary telegraph instrument after it has traveled through an aerial gap of 200 miles.

Mr. Voorhees says that the number

of errors is no greater than those that formerly occurred in wiring. Telegraph bills have been largely reduced and quicker communication assured. When there is much interference from river and lake boats, or static, the operators verify messages by, repeating; but, ordinarily, this has not

been found to be absolutely necessary.

The Dearborn station uses a wave length of 500-520; the Springfield station, 465. The broadcasting privilege has rarely been taken advantage of. One of the few times was when Edsel Ford announced that there would be a cut in tractors.



Interior view of Henry Ford's radio station, showing the equipment whereby thousands of messages are received and transmitted weekly. To the right of the room is the receiving gear. On the left is the transmitting set.

The Radio Primer

The beginner who follows regularly this department in RADIO WORLD will secure a liberal education in the applied principles of radio science

Radio World's Revised Radio Dictionary

By Fred. Chas. Ehlert

Coil (Lattice Wound)—Multilayer coil with wire wound in criss-cross fashion.

Coil (Loading)—Usually an adjustable coil, or inductance, used to furnish longer wave-lengths.

Coil (Tuning)—Adjustable coil, or inductance, used in tuning.

Capacity—A term used in radio pertaining to condensers. The amount of capacity which can be stored up in a condenser is measured in farads. Since the farad is much too large for practical radio use, the unit employed is the microfarad (MFD) or one-millionth of a farad.

Close Coupling—When two coils are placed in close relationship to each other, so as to cause mutual induction to a higher degree, they are said to be closely coupled.

Choke Coils—Coils wound to contain a large amount of self-induction. They have a choking effect when in the path of alternating currents. Usually the coils are wound over an iron core which is generally made up of a bundle of fine wires, or laminated sheets, insulated from one another to prevent eddy currents. The idea of this is to check the amount of current flowing in the circuit by reaction. This choking action when introduced in a radio circuit is called impedance.

Circuit Breaker—A device used in radio to open or break a circuit when the current reaches a certain value.

Circuit—A complete metal path for conveying a circuit.

Chopper—A motor-driven interrupter used with C-W transmitters.

Code—Combination of dots and dashes.

Core—The steel, or soft-iron, center of an electromagnet.

Counterpoise—An artificial ground. A large amount of sheet metal, or wire, spread out and insulated from the ground. The counterpoise is usually just beneath the regular aerial. The counterpoise is used in aircraft where a ground connection would be out of the question.

Converter—A machine used to convert direct current to alternating, or vice versa.

Coupler—A device for transferring radio energy from one circuit to another.

Coupling—A non-metal connection between two radio circuits formed by two coils of wire. One may be placed inside the other or near it.

Calibration—To measure and scale off an instrument, the measurements of which are unknown, with a calibrated instrument the measurements of which are known.

Commutator—The rotating contact device of an armature in a generator or motor.

Crystal detector—A device used to rectify the oscillating currents to direct impulses which, in turn, effect or operate the diaphragm of a telephone receiver.

Cycle—A complete change of a current or two alternations.

Cynometer—An instrument used to determine the frequency of oscillations.

Present Practice for Eliminating Static

ACCORDING to the Bureau of Standards, a great deal of work has been done by radio engineers and scientists in an effort to reduce the interfering noise caused by static and strays. Certain devices are in use by means of which strays are considerably reduced, but the apparatus now employed is usually too elaborate to be used at the ordinary amateur station.

One method which the amateur will find helpful in reducing certain types of strays is to use, instead of the usual elevated antenna, a coil antenna and a more sensitive receiving set. A coil antenna may be constructed by winding a suitable number of turns of wire with proper spacing on a square wooden frame about 4 feet square. Certain types of strays seem to come from a particular direction, but many strays have no directional properties. The coil antenna has the property of receiving a strong signal when pointed in the direction from which a signal is approaching, and receiving only a weak signal when coil is not directional.

To Receive 500 Miles

HOW many tubes will be needed in order to receive messages over a distance of 500 miles? What type aerial should be used with such a set-up? Such questions are easy to answer, as a general thing. However, a great deal depends on local atmospherics. At least two stages of amplification are needed with detector, which would involve three vacuum tubes. When using a set employing three vacuum tubes, a good aerial should be erected to receive this distance. If a good long aerial is strung up, well insulated, and with proper lead-in, excellent results should be obtained.

Proper care should be exercised when attempting to bring in lead-in through some part of a building. This is best worked by using good insulators. Never use the same ground as that used for telephones.

The Beginner's Catechism

By Edward Linwood

WHAT is the use of the variable condenser across, or in shunt, to the secondary of the variocoupler?

The variable condenser, when placed in the circuit of the tuner serves to add capacity to that circuit and, furthermore, permits a finer degree of tuning of the secondary than could be obtained by only varying the value of the inductance of the secondary circuit.

* * *

How may I decrease wave length lower than that of the fundamental wave length of the aerial?

This may be accomplished by simply placing a variable condenser in series with the primary winding of the tuning coil or variocoupler.

Why is it that the positive pole of the B battery must be connected to the plate of the vacuum tube?

Since the filament of the tube throws off negative electrons, we must have the plate so that a positive charge is placed on it. This will give, in turn, unlike poles; and, as unlike poles attract, we then have what it is termed a rectifier. Had we placed a negative charge on the plate, it may be seen that we would have like poles, or no attraction.

The B battery supplies the current which flows in the phone circuit.

* * *

Why do we need a rheostat?

Because it regulates the brilliancy of the filament. If the rheostat is turned so as to increase the brilliancy, more electrons will flow in the tube.

The Radio Primer has been published regularly in RADIO WORLD since issue No. 1, and will be a regular department in order to instruct and aid the many thousands of amateurs who are joining the ranks of radio enthusiasts every week.

Radio Abbreviations and Their Meanings, for Everything Used in Receiving and Transmitting

Compiled by Frederick J. Rumford, A.M.A.I.E.E.

A—Amperes.	F—Filament.	MOD—Modulator.	STP—Step, stage.
A, B, C, D—Secondary inductance large steps, or loading coils.	FD—Farad.	OFF—Off.	SW—Switch.
A, B, C, D—Secondary inductance, or small steps.	FX—Fixed.	OM—Ohms.	TEL—Telephone receivers.
AC—Alternating current.	G—Grid.	ON—On.	TGR—Telegraphy.
AF—Audio frequency.	GEN—Generator.	OPT—Output.	TIC—Tickler.
AM—Amplifier.	GND—Ground.	OSC—Oscillator.	TLP—Telephony.
ANT—Antenna.	H—Henry.	OUT—Out, outside.	TR—Transformer.
AP—Aperiodic.	HDN—Heterodyne.	P—Plate.	TRST—Transmitting set.
BZ—Buzzer.	I—Current.	PAR—Parallel.	TRT—Transmit.
BAT—Battery.	IN—In, inside.	POT—Potentiometer.	TUN—Tune.
BFD—Bilateral direction finder.	INC—Increase.	PRI—Primary.	U—Undamped.
BRG—Bridging.	IPT—Input.	R—Resistance.	UDF—Unilateral direction finder.
C—Condenser.	JK—Jack.	RCT—Rectifier.	VT—Vacuum tube.
CM—Centimeter.	JPR—Jumper.	REC—Receive.	V—Volts.
CPG—Coupling.	K—Per cent coupling.	RHEO.—Rheostat.	VAR—Variable.
CR—Crystal.	KY—Key.	REMCON—Remote control.	VMR—Variometer.
CY—Cycles.	L—Inductance.	REC.—Receiving set.	W—Watts.
D—Damped.	LDG—Loading.	RF—Radio frequency.	WV—Waves.
DC—Direct current.	LK—Leak.	SBY—Standby.	X—Reactance.
DET—Detector.	LP—Loop.	SEC—Secondary.	Z—Impedance.
DMY—Dummy.	LS—Large steps.	SH—Shunt.	WL—Wave length.
E—Potential.	LSCPR—Loose coupler.	SM—Smoothing.	1, 2, 3, 4—Primary inductance or small step.
	M—Meters.	SND—Send.	I, II, III—Primary loading inductance, or large steps.
	MFD—Microfarad.	SS—Small steps.	
	MH—Millihenry.	STD—Standard.	
	MIC—Microphone.	STG—Stopping.	

Replies to Beginners' Questions

What is the use of an amplifier?

An amplifier is an instrument which makes possible the magnifying of weak signals, or sounds, in an electrical circuit. An incoming radio wave may be so weak that the sounds cannot be heard in the telephone receiver, yet throw in a one-step or two-step amplifier and immediately the sounds are loud and clear.

* * *

What is the use of a tickler coil in a tube detector?

The use of a tickler coil in a tube detector is to transfer part of the energy of the oscillating plate current set up by the incoming oscillations back into the grid circuit, thus producing amplification.

* * *

What is sulphation of a battery? How does it get that way?

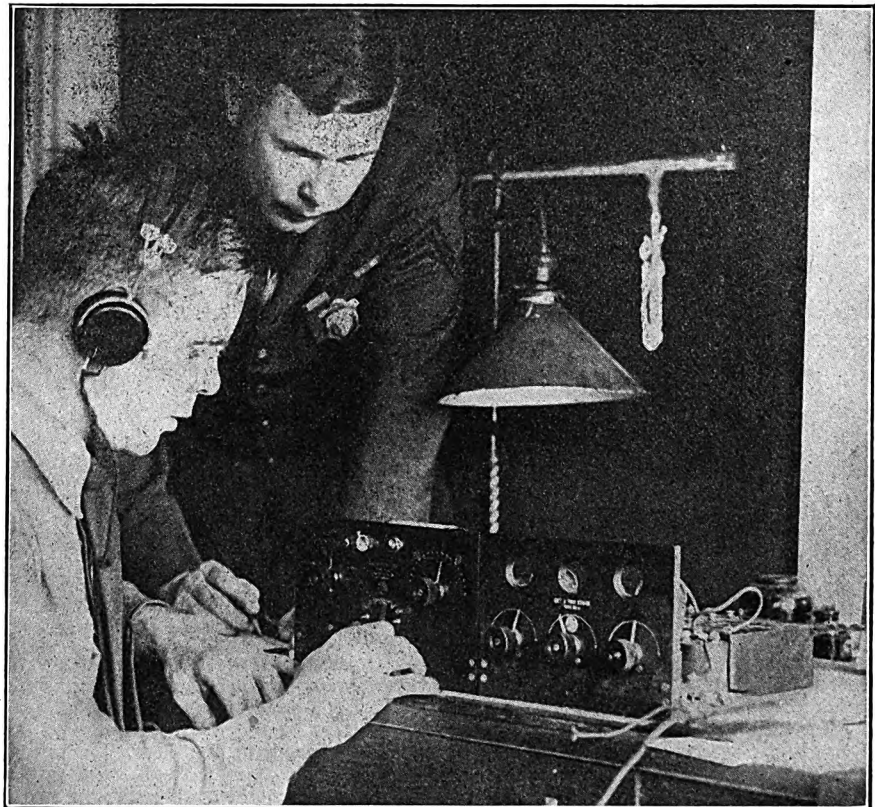
Sulphation of a battery may best be described as a disease. It occurs only in a lead cell. It is the formation of a white snowlike powder scale, that appears near the terminals of a battery and on the surface of the plates. Generally it is due from either overcharge or permitting a battery to stand idle in a discharged condition.

* * *

Why are the grid condenser and leak combined?

Principally for the sake of compactness and because they lend themselves to such a combination.

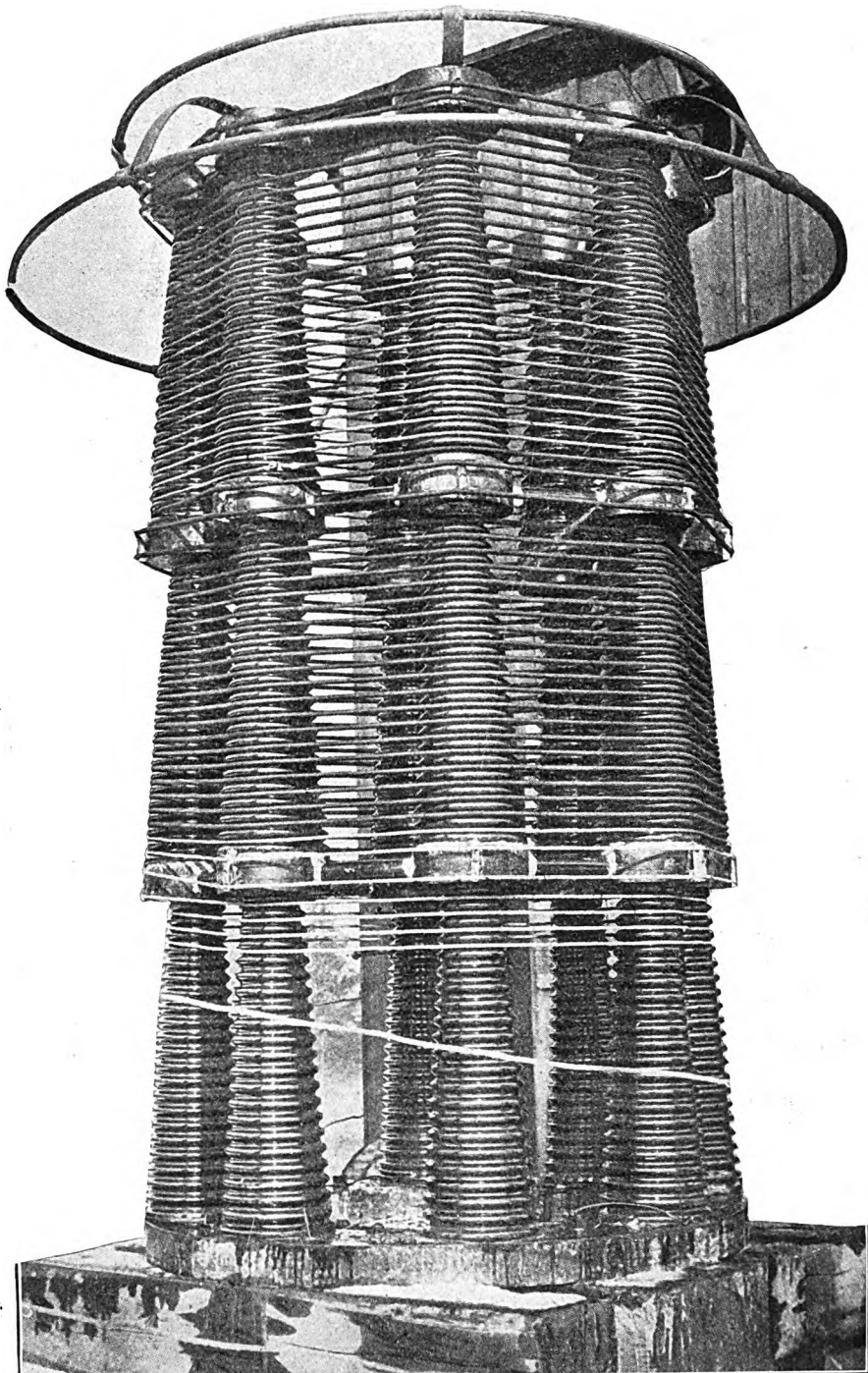
Massachusetts Police Use Radio



(C. Underwood & Underwood, N. Y.)

No longer does the State Constabulary of Massachusetts depend on the telephone or telegraph for instructions that may lead to running down a crime. The Massachusetts State Police has solved this problem by installing radio apparatus in its various stations. The above photograph was taken recently at Framingham when the first message was received at the headquarters of Troop A of the constabulary. Radio sets will be used even on motor-cycles, when, in the dead of the night instantaneous communication may be had. Sergt. Roy E. Kimball is photographed writing down the first message, while George Skinner, police radio-operator, is tuning-in on a police report from Medford Hills.

Gigantic Tuning Coil Hurls Radio Waves Across Atlantic



(C. Underwood & Underwood, N. Y.)

In recent issues of **RADIO WORLD** several of the large transmitting stations are described, including those at Nauen, Germany, and Sayville, Long Island. Another important American station was used exclusively during the World War by officials of the United States Navy Department. This station is situated at New Brunswick, New Jersey, and is now operated by the Radio Corporation of America. It has always been a problem to control several hundred kilowatts of power at frequencies of about 20,000 cycles per second by breaking it up into dots and dashes per minute or more. To radiate the large amounts of power required to bridge trans-oceanic stretches a large and lofty radiating system, or aerial, is required at the New Brunswick station. A row of 400-foot masts, stretching some 6,000 feet, from the station support the "multiple tuned" aerial system. In order that the proper and most efficient amount of power may be used to advantage a tuning system must be employed. In the photograph it may be seen clearly what is termed "a large tuning coil." It was built by the General Electric Company for the New Brunswick station. It is used in transmitting electrical waves across the Atlantic. It is in position outside of the radio station. Particular attention should be given the massive insulators, through which every ounce of power is sent to the aerial system.

Marconi Can Now Send Radio to a Chosen Point

SENATOR GUGLIELMO MARCONI, the radio wizard, came to New York, a few days ago.

He arrived on his yacht, "Electra," perhaps the most perfectly equipped radio vessel afloat.

Mr. Marconi's first important engagement in New York was a lecture before a thousand radio and electrical engineers at the United Engineering Societies Building.

He startled those present—and the world as well—with tests of a new device that guides radio in a chosen direction!

He produced a "baby wireless set" and sent signals about twenty feet, demonstrating how a beacon of waves may be hurled at a station specially intended to receive it.

This illustrates one of his most recent experiments. It is an important new step in radio. Mr. Marconi and his engineers are still working on it.

With this same midget apparatus he pointed out a vast undeveloped field—the field of the short wave.

Marconi believes that the short-wave field is capable of as high development as the field employing hundreds of thousands of meters.

Marconi began his wireless experiments with the short wave. Now he returns to it for new fields to conquer.

The short-wave field has been neglected both in America and in Europe, he claims.

With waves of about $3\frac{1}{2}$ meters, Marconi has hurled a shaft nearly a hundred miles in a desired direction.

To accomplish this, he uses a reflector apparatus, and the wave is caught at the receiving end on a horizontal metal standard.

When the semi-circular reflector, a skeletonized device covered with wires and resembling a dish cut in half, is turned with its open side toward the receiving stations, the signals are heard loud and clear. When the open part is turned away the signals become inaudible.

Popularly, it throws a radio wave somewhat in the same manner in which a mirror throws a ray of light.

Radio waves have been thrown, in this manner, from London to Birmingham, a distance of 99 miles. The results have been highly satisfactory.

It is a system of concentration with reflectors which will greatly enhance the value of air apparatus.

It makes impulses rebound.

It is a big step forward in radio. What the world will unfold in this new science is beyond the comprehension of man.

Marconi said to the thousand engineers: "America leads the world in radio."

Radiolets

"Are your new neighbors modern people?"

"Modern? Say, they sent in last night to borrow our radio set."—"Buffalo Express."

* * *

"Senator, do you keep your ear to the ground?"

"Not now. I got a radio outfit."—"The Journal," Kansas City.

The Use of the Vacuum-Tube Detector

THERE seems to be considerable dissatisfaction among certain amateurs who have sets equipped with the crystal detector with the distance and range that it affords. Those who wish to receive from a wider range, may do so by using what is called the vacuum-tube detector. This detector will not be so expensive as some amateurs think; but for the increased range that may be had, it is well worth the difference between the crystal and the tube detector. For short distance, the crystal detector will work well; but for reliable work under exacting conditions, the crystal detector is limited to about 20 miles range.

Some crystal users frequently wonder if a loud speaker may be used in conjunction with the crystal detector, but it is entirely out of the question for such a machine to function. Possibly a large aerial is erected in conjunction with a crystal detector, in

By Geo. W. May, R.E.

range of your set, you may do so by simply adding a one-step amplifier to this circuit. The following apparatus will be needed if you care to change your detector to this vacuum-tube outfit:

One tube socket. One detector tube. One filament rheostat. One grid condenser and leak. One 22½-volt variable B battery. One six-volt A battery.

A word to battery buyers: Be certain to purchase a good battery and, also, a good-sized ampere-hour battery, as the higher the ampere-hour battery capacity, the less it will have to be placed on charge. Nothing is more discouraging than to have the battery start to run down, particularly when you are entertaining some new radio enthusiasts.

Accompanying this article is a schematic diagram of tube hook-up, better known as a straight hook-up. Inductance L1 is the primary winding of the coupler, L2 is the secondary winding of the coupler. The variable condenser, which is in shunt to the secondary, has a capacity of .0005 mfd., and its function is for tuning the secondary circuit. The grid leak and condenser may be had at any radio store. The 22½-volt battery is connected in the plate circuit, as shown, as well as the telephone receivers.

One side of the filament of the tube is connected to the wire running from the telephones to the variable condenser. Be sure that the 6-volt storage

battery is connected in right. Before making necessary connections, be sure that the battery leads are correct.

If the leads from the 22½-volt battery are crossed with the filament, or A battery leads, you may be surprised to learn the filament of the detector tube has burned out. This will mean that another tube will have to be purchased. As the price is \$5 it is well worth the tube to be certain that the connections are right before lighting

The rheostat in series with the tube which controls the filament lighting of the tube, is also shown. In case this is turned to high, the tube will also burn out. These precautions will have to be undertaken; but outside of this, there is not much more to worry about. Generally the socket for the tube is marked P, for plate; G, for grid; F minus, for filament; and F plus, for filament. These two F marks are to

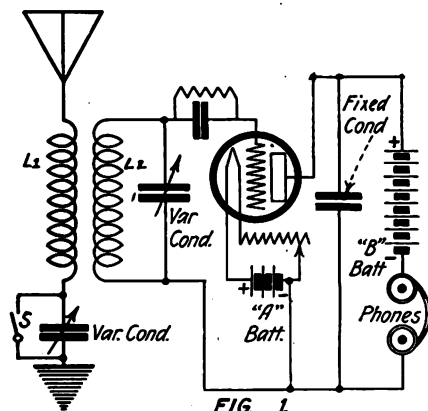


FIG. 1.

Figure 1—Schematic diagram of what is known as a straight hook-up. The various elements are shown in the circuit. Suggested by George W. May. Drawn by S. Newman.

order to hear the broadcasting; but within a short distance, the crystal detector is used. Hence, sooner or later, the vacuum-tube detector is brought into play regardless of what other equipment may be needed. One thing must not be forgotten: when a tube outfit is used additional steps of amplification can be used.

The cost of a tube outfit would not exceed a little over \$30. This would include all necessary storage batteries. Dry batteries are not recommended, as their life for this work is very short. In the long run, it would be far cheaper to purchase a good storage battery, even if it did cost a few dollars more, than to hesitate and purchase dry cells at various occasions.

If you have some equipment on hand you may remodel your set in a few hours, and it will be possible for you to have a vacuum-tube set. Furthermore, any time you care to increase the

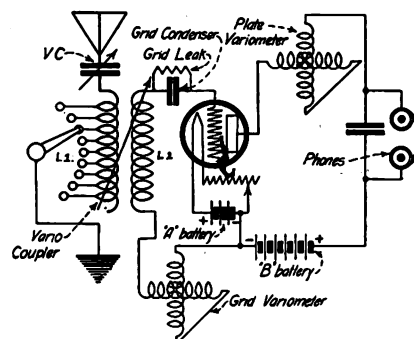


Figure 2—Schematic diagram of the so-called regenerative receiver. This is the variometer type. In the above hook-up it is easy to discern where the variometers are placed in the grid and plate circuits, respectively. Suggested by George W. May. Drawn by S. Newman.

Before You Invest Study Radio

THE patent situation is an element which should have the investor's attention. Of course, most of the older and more stable manufacturers naturally have their various products thoroughly covered by all the patent protection which the government affords. Most of these responsible designers and manufacturers have been too busy to undertake the prosecution of infringements, but the day of reckoning will come, and those opportunists who are trying, carelessly or unscrupulously, to capitalize the public demand for radio, will be obliged to answer for their violations of government-granted rights on existing inventions.

Let the investor, before placing a dollar in radio, study it thoroughly. Let him find out whether the man he backs is a reputable business man or an unscrupulous operator. Let him judge, not the isolated hand-made set, but the first outfit made in quantity by standardized machinery.

be connected to the 6-volt battery. Be sure to connect them to the proper polarity and with the rheostat. In working with this set, you will learn by experience that when lighting the tube it will start to hiss. The most sensitive spot is just below the point where the tube starts to hiss. Once again you are cautioned not to turn the filament too high as this will probably burn out the tube. By keeping the filament at its proper brilliancy, the tube's life will be lengthened. By using the tube you will soon find the value it offers.

After your set is completed and working at its best, you will find you can still increase the signal strength by inserting a variometer in series with the plate and grid circuit, as shown in the diagram. Study carefully the schematic diagram of No. 2 and see just where the variometers are placed. The hook-up is the same as above with the only exception of the plate and grid variometers.

Congress to Clear Aerial Traffic

By Carl Hawes Butman

WASHINGTON.—The mystic symbols "S-3694" and "HR-11964" designate government papers which bear directly on the future development of radio in this country. These papers are exactly alike and comprise the proposed radio legislation introduced in Congress. The first bill was introduced by Senator Kellogg, of Minnesota, on June 8, and was referred to the Senate Interstate Commerce Committee, while the House bill, prepared and introduced by Congressman White, of Maine, was presented on June 9 and was turned over to the Committee on Merchant Marine and Fisheries. Mr. White is now more sanguine about the early consideration of his bill by this committee, as the Ship Subsidy Bill was reported out recently, clearing up one of this committee's big problems.

At the Department of Commerce, radio officials are waiting the enactment of legislation so that they can clear the aerial traffic, so to speak, especially along the route of the 360-meter wave on which all 348 broadcasting stations are now operating. With the passage of the bill—and there seems little doubt that it will pass, as there are virtually no opponents to it, a conference in Washington of all radio inspectors will

be called to meet with the new radio advisory committee of twelve authorized in the bill to aid Secretary Hoover in enforcing the legislation.

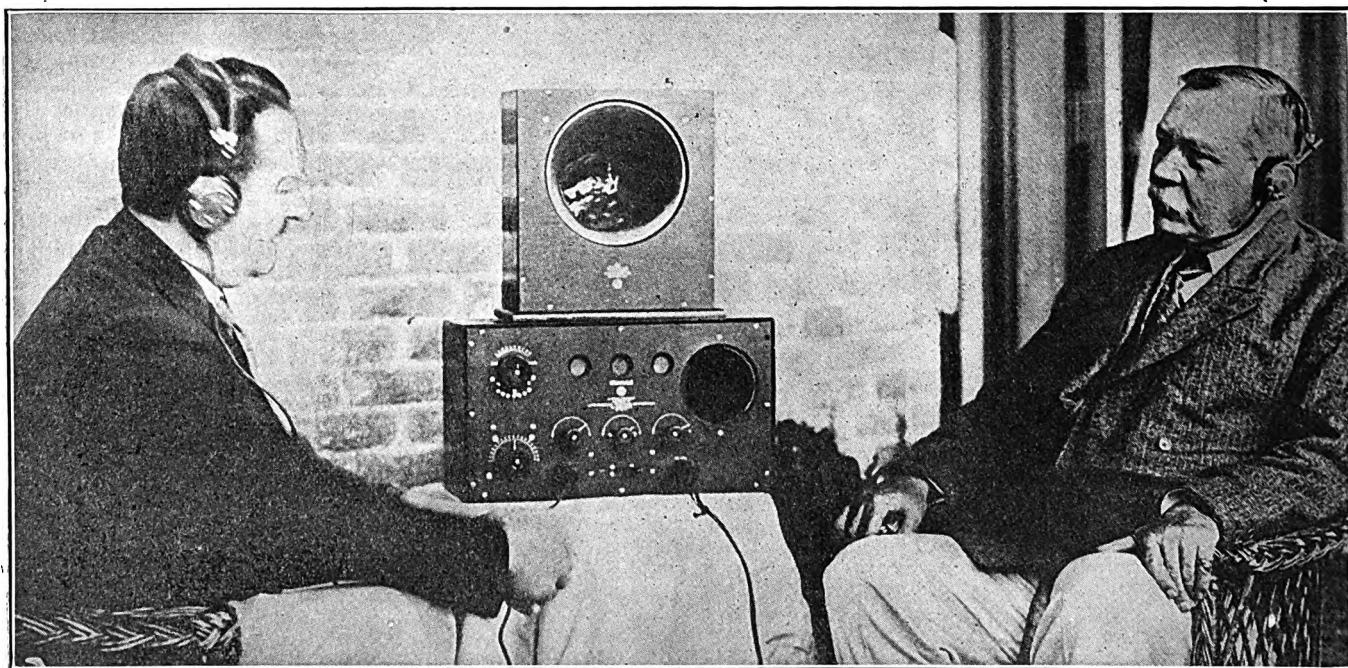
To date, no one will hazard a guess as to the personnel of the committee, although it is thought that the six governmental representatives will include a number of the officials who have already coöperated with the department in its recent conference on radio-wave distribution and the necessary legislation. The following men were conspicuous in that work and may serve again: Dr. S. W. Stratton, Bureau of Standards; Major-General George O. Squier, United States Signal Corps; J. C. Edgerton, United States Post Office; W. A. Wheeler, Department of Agriculture; D. B. Carson,

It is even more difficult to predict the members to be selected from civil life, as there are many interests to be represented by only six men. The manufacturers of radio apparatus must be included, as well as transoceanic operators, broadcasters, amateurs, radio engineers, commercial operators, and probably educational institutions and news agencies, which makes eight interests. This shows the difficulty which may be encountered in making a fair distribution, although one man

may be found who can represent two of the classes vitally interested in radio.

One of the first problems to be encountered by the department will be the assignment of new wave lengths so that interference will be decreased, and then the problem of whether to zone the country or classify the stations will come up. If waves are assigned by zones, it is pointed out, local interference will become greater; whereas, if wave lengths are distributed to different classes of operators—as, for example, one wave to newspapers and one to entertainment—the air would be jammed again with various news stories on one wave length and music and song on another. Naturally there are not enough waves between 285 and 485 meters to give every operator of the 348 broadcasters a specific length—so it would appear that a plan of combined classification and zoning would have to be tried out and regulated further by specific hours for operation. It is though, however, that by using the system of classification detailed by the full radio committee recently, and a zoning system with, perhaps, the maintenance of local time schedules in cities where there are several broadcasting stations, much can be accomplished to clear the air.

Conan Doyle, Famous Author and Spiritist, to Study Radio Here



(C. Underwood & Underwood, N. Y.)

Sir Arthur Conan Doyle (at right) and F. D. Walker, vice-president of the John Firth & Company Radio Corporation, New York, listening to a concert by radio at the Ambassador Hotel, Atlantic City, N. J. Sir Arthur became an interested student of the radio when Mr. Waller, a radio expert, took a set apart and explained its workings. The spiritist and author will learn all he can about radio while he is in America. He thinks it will aid him in his psychic investigations.

Radio and the Woman

By Crystal D. Tector

I WANT you to know what radio did for me," said a pretty matron, a very particular friend of mine, when I met her coming to town from her country place near New London. "You know, my husband is radio 'bug.' At least that is what the boys call him. Well, the other night he had to stay in New York, and left me with mother and the children—and, I almost forgot, the radio set. Of course, I stayed awake for hours wondering if burglars would break in. Finally, I did hear strange noises. It seemed as if someone was in the kitchen. I knew that if I yelled, I would be laughed at if my fears were groundless; so I just slipped on a wrapper and tiptoed downstairs to the living room. I had seen Jack tune in a dozen times, so I sneaked over to the set and turned that little knob. Luckily there was a steamer somewhere on the sound sending out signals, and I caught them. You should have heard that noise! Yes, the kitchen door slammed. And I did hear footsteps on the gravel walk outside. Mother came down, and we made an investigation. All they got away with was a silver serving-tray. I call the receiving set my watch dog."

* * *

Another friend, one with a family of six, four of them girls still under twenty, tells me that they are keen for radio and are engaged in building their own set. They have a big bungalow near Lake George. Adjoining them is a colony of boys; and the four girls are vying with them in making a set that will pick up every broadcasting station within a reasonable radius. And these girls are learning all about the new science, too. I know them; and I know that what they set out to do they stick to until the job is finished. I am invited to spend a week-end with them, and I will tell you how the rivalry progresses.

* * *

Anent the above, school authorities in all parts of the country report a remarkable interest in radio, not only among the young men but among young women as well.

* * *

Y. M. C. A. radio schools report several young women in their classes. Have you heard of Eleanor Gould, of Minneapolis? She is one of the many girls in this country who have taken up radio. She is just eleven, but she is making her own crystal set. When she finishes, she says, she is going to make a vacuum set. Miss Eleanor wound the coils, mounted the parts in an oak cabinet, and even strung the aerial from the roof of her home. I simply mention this is an example of what girl fans throughout the country are doing.

* * *

I deeply appreciate the letters that women readers of RADIO WORLD send me. Indeed, I did not know that our weekly has so many women readers. One writes: "We all thought that radio was a terrible mystery; when my husband, a traveling man bought a set. We looked in wonderment whenever he tuned in, and wondered what it was all about when he talked in radio terms. But the most disappointing thing was what we were to do when he was 'on the road.' Well, I was determined that we should not be without our entertainment. I followed your dictionary, learned the terms, studied the set—and I'm proud to say—yes, mighty proud!—that I can operate as well as friend husband. I'm taking up code now. Every night our home (She lives up near Lake Hopatcong.) is crowded with neighbors. They all want sets now."

* * *

I was looking over the publications at a newsstand at the Grand Central Station, the other day. A smartly dressed woman came up and asked the attentive clerk for a copy of the latest radio publication. I was not at all displeased when he handed her last week's issue of RADIO WORLD. "I see this is a weekly," said the woman. "I'm glad of that. My boy, who is at a boys' school in Massachusetts, says he can scarcely wait for the monthly radio publications to come out, and I know he'll be delighted to learn that he can get a radio paper every week. I imagine he will want to subscribe for it." And she walked away, looking as if she were a she-Columbus who had discovered something new for the family hope-

Miss Hope Hampton, First National film star, who is not only an ardent radio fan, but also a member of a radio association and a practical worker. She was photographed taking a crystal set apart in order to mount it on a vulcanite panel. This is not an easy undertaking for an amateur, and it shows what the clever radio woman will attempt to-day.

(C. International)



ful. It looks, from where I write, as if another new name were to be added to a certain subscription list.

* * *

A drive through Westchester County, last Sunday, disclosed the fact that there has been a very decided and noticeable increase in the number of aerials in that region. A casual glance at the roof tops in the trip from Larchmont to Portchester, enabled the counters to espy sixty-seven aerials along the roads made by the tourists. Can you possibly imagine how this number will be increased to during the coming twelve months?

* * *

I was in the office of an eminent lawyer the other day, and was told that the big legal light was in conference and could not be seen just at the moment. Over the mahogany and glass partitions came the sound of a well-known voice and the following one-sided dialogue was distinctly heard: "All right dear. I'll try and have the stuff shipped to-day or to-morrow so that we can have it installed before Sunday. Tell George that I'll try and get the amplifier he wants. . . . Certainly: I'll get the best of everything so that he will start right. Good-by, dear." All of which indicated that the important legal conference had more to do with the interesting subject of radio.

* * *

Just to show that woman knows something about the technical as well as the amusement angles of radio, let me cite the case of a New York matron whose husband is a well-known electrical engineer, and is, in fact, the inventor of more than one important electrical device. This woman submitted to her husband's firm, a number of drawings showing certain improvements in a radio receiving-set. She sent them in under an assumed name. The matter was taken up by the husband and other members of the firm's technical staff, and it was decided that there was something worth while in the proposition. A letter was written to the name and address given, an appointment made for later in the week, and, at the proper hour, the wife walked in upon her astonished husband and his associates and declared she was ready to talk business. As the question of sex had nothing to do with the value of her invention, terms were quickly made. Now both husband and wife are anxiously awaiting the outcome of the little woman's skill and initiative. It is said, by the way, that the wife has refused a large sum of money for all her rights in the patent—this, on the advice of the husband.

Limited Commercial Broadcasting Stations Licensed, June 10-16

KDZW—Claude W. Gerdes, San Francisco.

KDZX—Glad Tidings Tabernacle, San Francisco.

WFAF—Henry C. Spratley, Poughkeepsie, N. Y.

WFAC—Superior Radio Co., Superior, Michigan.

WFAD—Watson, Weldon Motor Supply Co., Salina, Kansas.

WAAF—Chicago Daily Drovers' Journal, Chicago, Ill.

WFAK—Domestic Electric Co., Brentwood, Mo.

WFAH—Electric Supply Co., Port Arthur, Texas.

WCAH—Entokin Electric Co., Columbus, Ohio.

WFAJ—Hi Grade Wireless Inst. Co., Asheville, N. C.

KWZZ—Kinney Bros. & Sipprell, Everett, Washington.

WFAG—Radio Engineering Laboratories, Waterford, N. Y.

WFAP—Brown's Business College, Peoria, Ill.

WFAT—Daily Argus-Leader, Sioux Falls, South Dakota.

WFAH—Hall & Stubbs, Sanford, Maine.

Latest Radio News of the Week Photographs

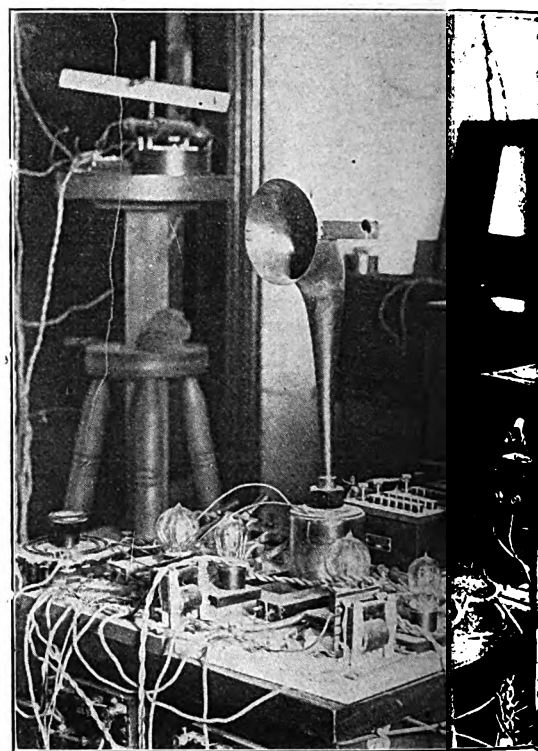
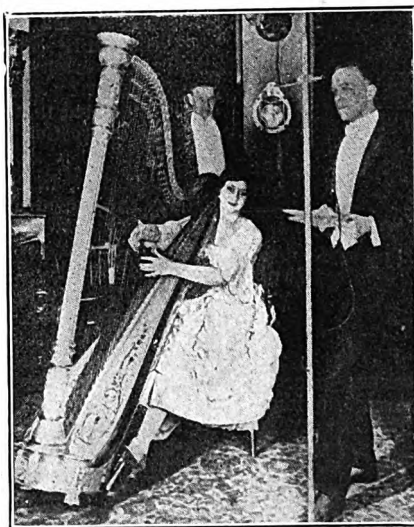


(Above) The young radio fans are busy on the roofs of the tall apartment houses of New York City. These high buildings make excellent foundations for aerials, for they are generally clear of interference. You who live in the country have trees and telegraph poles for your antennae; but the city fan has an equal chance to listen in with the clear plateau of an apartment-house roof for his base.

(C. International.)

(Right) Now you may take a peek into the transmitting room of the broadcasting station of WGY, the General Electric Company's station at Schenectady, New York, one of the most powerful in America. Mlle. Ladd, harpist of the Opera Comique, Paris, is sending a solo over the ether. At the microphone is Kolin Hager, studio manager. Standing behind Mlle. Ladd is Robert Weidaw, assistant to Mr. Hager.

(C. Underwood & Underwood.)

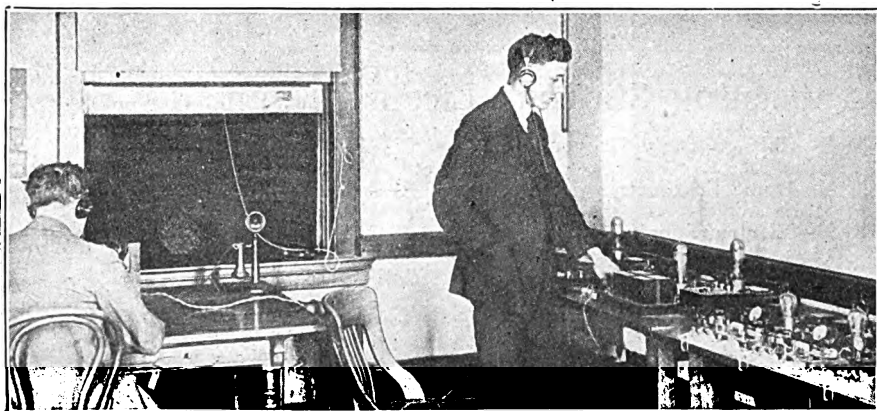


(Above) One of the most interesting new radio devices is shown in this photograph. It is called the oscillograph—a machine that either photographs currents produced in radio research work or permits the operator to watch them in action. It utilizes two distortionless amplifying tubes and two power-tubes.

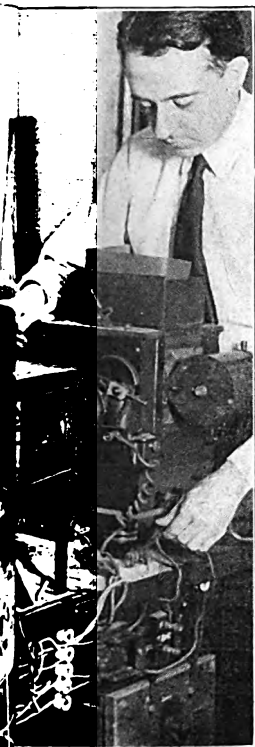
(C. Kadel & Herbert News Service.)

(Left) They check up all the radio programs sent out from a big broadcasting station; that is, in an operating room adjoining the transmitting room a close "check" is kept on all broadcast matter. By means of the apparatus on the table at the right, the electric currents set up in the microphone are amplified before being transmitted by wire to the broadcasting plant. The utmost care must be taken, for transmitting is an important undertaking. The photograph was taken at WGY, where everything is up to the moment.

(C. Underwood & Underwood.)



News and Novelties Week Told in Photographs

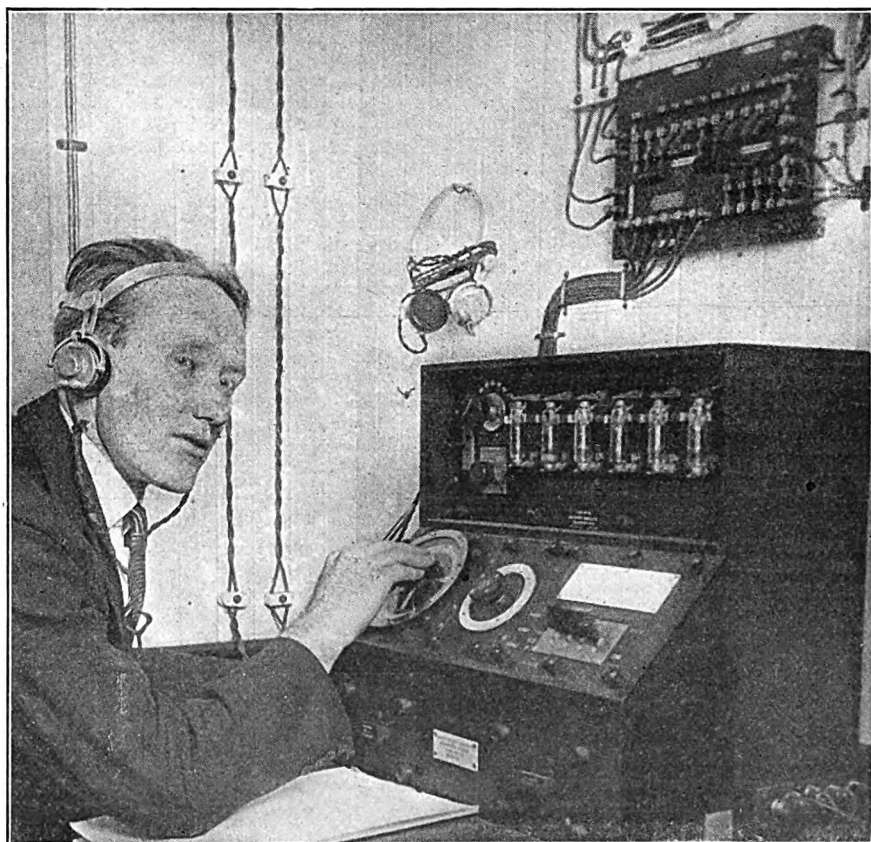


(Right) At a recent radio show in Greater New York the Army and Navy boys vied with one another teaching the fair sex the mysteries of radio. They are all pretty keen radio experts—these young men in Uncle Sam's service. Of course, the Army uses different apparatus from the Navy. It may be difficult for a young lady to choose between the two, but, as a usual thing, young ladies are very diplomatic when it comes to a choice in anything pertaining to the service.

(C. Underwood & Underwood.)

(Below) The radiophone is a wonderful thing, but what about the audience? Marie Prevost, moving-picture actress, and her director, Hobart Henley, are listening in while Harry D. Brown, electrical engineer, is explaining "how she works." It was the first time Miss Prevost had ever listened in.

(C. Kadel & Herbert News Service.)



(Above) The latest type of Marconi direction finder—an aerial of two loops at right angles to each other—which determines the direction of messages from shore stations and ascertains the exact location of a ship in a fog. The instrument is one of the new wonders in radio.

(C. Ewing Galloway, N. Y.)

Answers to Readers

IS a tuning coil 6 inches long and 4 inches wide, wound with No. 24 cotton-covered wire with taps taken off, better than a two-slide tuning coil, 8 inches long by 4 inches wide?—Harry Walton, Omaha, Neb.

A two-slide tuner is the best as it gives better selectivity.

* * *

In **RADIO WORLD**, No. 10, June 3, under the heading, "Cost of a Single Circuit Receiver," the author makes several statements which I would like to see answered more fully.—J. Davis, Brooklyn, N. Y.

No doubt the author of the article, Howell W. Miller, 565 West 139th Street, New York City, will be pleased to reply.

* * *

What system of wiring makes a circuit, a regenerative circuit, or hook-up? What is the number of the patent (Armstrong) that we read so much about? What is the part, or type of a circuit the Armstrong patent covers?—R. C. May, Dorchester, Mass.

In brief, regeneration is a circuit employing a vacuum tube detector whereby the currents are fed back through the tube by means of coupling inserted in the plate circuit to the grid circuit, thus causing a large degree of amplification to take place without the aid of additional amplifiers. The Armstrong patent is No. 1,113,149. In regard to Mr. Edwin H. Armstrong's patent, we would suggest that you discuss this matter with Mr. Armstrong, Columbia University, New York City.

* * *

How many plates should be used in a series condenser with aerial?—Arthur Stokes, Omaha, Neb.

Use 43 plates. A smaller condenser will cut down the wave length too much and reduce the signal strength.

* * *

I am making a set according to the enclosed diagram. What do you think of it?—G. L., Jackson City, Mich.

The circuit is all right, but be careful when wiring.

* * *

I have a vactuphone, made for deaf people. Can I use this for radio?—Paul Jones, Phoenix, Ariz.

No.

* * *

Which will make a crystal set have a longer wave length and make it more efficient—a loose coupler or a vario-coupler with two variometers?—John Thompson, Richmond, Va.

A loose coupler is the most efficient tuning device for crystal reception.

* * *

Will copper wire that has turned black from the weather give the same results as when new. Kindly let me know if the

enclosed hook-up for a lightning arrester is correct.—Arthur Chase, Binghamton, N. Y.

The black is nothing but an oxide of copper and will not affect results. Your hook-up is correct.

* * *

Will a two-, three- or four-wire aerial increase the range of a receiving set, consisting of regenerative, a receiver and a two-stage amplifier?—Edward Lebak, New Haven, Conn.

Not so much for receiving as for transmitting. One wire should be sufficient for receiving purposes.

* * *

I made the set described by G. W. May in **RADIO WORLD**, No. 11, dated June 10. I heard WJZ the first night. When I took the variable condenser out of the aerial circuit, I got excellent reception from WJZ and 2XB. Why don't I hear more stations? My aerial is 65 feet long, with two wires, inverted L type.—Robert G. Frank, New York City.

The variable condenser cuts down the wave length. Evidently, when the condenser was eliminated, you happened to be right on WJZ wave length. We suggest that you add one or two steps of amplification to your set, if possible, as this will give you wider range. Also see if you can erect one wire aerial about 100 feet long.

* * *

Regarding the circuit of Mr. Casmay's, described in **RADIO WORLD**, No. 8, dated May 20. What does the tickler consist of and how is it adjusted in relation to the secondary? Are the 600 meter coils loading coils?—W. R. Leslie, E. E., Highland Park, Mich.

The tickler consists of three quarters of the amount of inductance as that used in the secondary winding. It is adjusted by a rotor upon which this winding is wound, the rotor, in turn, being placed inside the tubing that holds the secondary winding. The 600-meter coils are not loading coils—merely coils which would enable 600 meters to be heard. Either circuit can be used.

* * *

How many plates are required in order to get the following capacities for variable condensers: .0005, .001, .002, and .003 mfd.—George E. Hoyt, Bridgeport, Conn.

See **RADIO WORLD**, No. 10, dated June 3, entitled "How to Compute the Condenser," by E. L. Bragdon.

* * *

Can slate be used successfully for panels? How does it compare with other dielectrics?—Joseph B. Lombardo, Phillipsburg, N. J.

Slate, electrically, is a very poor dielectric and nonconductor. It was used in past years as a panel for transmitters, but we have never heard of it being used for receivers. At present, nothing is superior to bakelite or hard rubber.

It Is Getting Smaller Every Day!



By Brown, Chicago "Daily News"

Only One Amateur in 100 Transmits

DO you think that the "radio fan" is a new arrival? The fan himself can tell you otherwise—although it is only within the past few months that he has become so amazingly numerous. In 1920, there were about 10,500 licensed amateurs in the country; last year there were 13,560. Amateur radio stations that receive only are not included in the licensed list; of the latter it has been estimated that there are 600,000 to 1,000,000 now in existence, while a year ago there were not over 60,000. The pre-war peak was in 1916 when the number of licensed stations was slightly over 5,600. During the war there was a large drop in the number because all but official stations were prohibited. In 1904 the money invested in the production of radio telegraph instruments was only \$114,050, and, in 1919, the amount had risen to \$7,600,698.—"The Evening Mail," New York.

The Kindly Ether

I always thought that ether was
A sort of paralyzing stuff,
That made the patient never mind
When surgeons got too rough.

And now I learn from radio
THE ether's not that kind,
But mystery in the air around
Like thoughts within a mind.

You cannot see, nor sense it,
Nor catch it in your glue.
It laughs at all the cameras,
And yet—it talks to you.

Odd things this radio has done;
Aladdin's lamp, it's beaten,
Some day, perhaps, ether will bring
A meal in to be eaten.

—"Mac," in "The Evening Mail," New York.

Controls 51 Stations

THE Signal Corps radio message center in the Munitions Building, Washington, D. C., now controls 51 separate radio stations throughout the country, connecting every corps area and numbers of small stations with army headquarters. During the past few weeks, stations at Camp Custer, Michigan; Miller Field, Staten Island, New York; Scott Field, Illinois; Rockwell Field, California; Camp Lewis, Washington, and Arlington, Virginia, have been added to the net of the Signal Corps.

SELLS MORE RADIO WORLDS THAN ANY OTHER RADIO PUBLICATION

Times Building, New York City, June 9, 1922.

RADIO WORLD, 1493 Broadway, New York City.

It may interest you to know that of all the radio publications handled on our stand in the Times Building, more copies of **RADIO WORLD** are sold by us each month than of any other radio publication.

Yours truly

(Signed) David J. Farley, Times Bldg., Newsstand

Hook-ups

By Albert P. Taylor

PROBABLY, by now, Bellevue Hospital, New York, has a receiving set. The officials planned to instal one. We can't help thinking what a difference radio reception would make to patients in any hospital. Instead of those old fired-out records, to have original music coming into the wards would be a good tonic—not necessarily bitter, either. Patients might have to listen to Dr. Copeland once in a while; but don't doctors prescribe counter-irritants?

It seems radio is being used by the police in several states to help in capturing criminals. Now, if we were an upper-story crook, we'd transmit to the party with the valuable gems, informing them of our interest, and ask 'em please to bring the stuff down to the first floor. In that way it would be a cinch to get the goods. They couldn't locate us through a phone booth and ———. We hadn't calculated on their stopping en

route to bring along one of those six-shooting heirlooms. There're a lot of new uses for radio just the same.

Let's shake with Alexander Graham Bell! That telephone of his can bring you out of a comfortable bed to find the operator called the wrong number. Of course, we need it to gossip with the family down the street once or twice a day. With radio, we can listen in when it suits us, and shut 'em off when it tires us without causing hard feelings. Just at present, you can't transmit to all the folks you know, even with code; but a few friends probably are initiated.

There's a drug store in Cincinnati which carries a fine window-display of radio equipment. No doubt they have a complete assortment of amplifier sun-daes, d.-c. frappes and cool drinks that are real transformers. There should be brisk trade with a loud speaker near a soda fountain.

One End of London-Paris Chess



(Courtesy of Adel & Herbert News Service.)

Chess, the most scientific game in the world, has been played by radio on several occasions—once while one player was at sea and the other in Chicago. Here is a photograph of Frank Walsh, a young inventor, in his home in London, England, playing chess with his brother in Paris—each move of the chess being made by radio. Mr. Walsh claims that the excitement is made more intense by the distance that intervenes—that waiting for his brother to make a move, while he studies his own board, adds a peculiar zest to the match. Chess is a game calling for the greatest skill and patience—but, Mr. Walsh says, radio does not take away from its most important elements in the slightest.



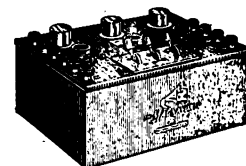
The Summer Camp is made complete by the

MAGNAVOX RADIO—

WHAT wonder that camping parties, clubs, summer schools, hotels and country homes everywhere are enthusiastically taking up Magnavox Radio to solve the inevitable problem—adequate amusement for every member or guest.

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No Wireless receiving set is complete without the MAGNAVOX Radio

Any radio dealer will demonstrate, or write us for descriptive booklet and name of nearest dealer.

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Radiograms

Latest Important News of Radio from the World Over, Told in Short Wave-Lengths

SUMMER Programs Must Not Be Overlooked by the managers of broadcasting stations. Radio is appealing strongly to the vacationist, and many people have taken their sets to the country. The camper, the sea-shore devotee, and he who can remain away from his office for a week or a month, no doubt will be greatly interested in the news of the day—particularly baseball scores. He will want the broadcasting station to substitute for his newspaper. He will want to be entertained—but, first of all, he will want news; but, if too much news is broadcast, the city man will object because he cannot be torn away from his evening paper. Why not broadcast more news during the day? The vacationist has plenty of leisure during the day—the city man has not!

* * *

Bobbins for telephone receivers, when used in radio, are wound with No. 40 single-silk, or enameled, wire. This wire is about the thickness of a human hair and requires very careful manipulation.

* * *

England is to be divided into eight broadcasting areas with one transmitting station for each area.

Washing hung on roofs to dry is a greater interference than static and much harder to eliminate. When you see the week's wash and the antennae in a seemingly unseparable tangle, you may realize the truth of this.

* * *

New Jersey has decided on a competition, in its various schools, in the construction of radiophone sets. Thus far, over 4,000 complete sets—some of them of a more complicated nature—have been built. The authorities claim that boys are learning more, through wireless, about electricity, batteries, the telephone, and ether, than they could assimilate through text books.

* * *

The Radio Amateur Bureau of the Third Naval District, located at South and Whitehall Streets, New York City, is now broadcasting its radio information immediately after the 9 p.m. press broadcast is completed. The station operates this amateur broadcast on a spark wave of 1,832 meters.

* * *

Michigan is to use radio in the rum-running war along its borders. One radio station has been established on the Upper Peninsula, at the State police sta-

tion, at Negaunee; another at Gaylord; a third in or near Grand Rapids; a fourth in or near Detroit; another in the Thumb district, comprising probably half a dozen sending and receiving stations to assist the state police and local officers in apprehending violators by broadcasting news about rum running. The central station will be at Lansing.

* * *

A wire should be used to "jump" the meter, so that the ground connection will be continuous. In most gas installations in the older houses an insulating coupling is placed between the piping and the gas meter. This renders the gas pipe useless for grounding purposes in connection with the radiophone receiver.

* * *

Radiotelephony is still an unknown science in Belgium. Only recently, King Albert listened to his first aerial conversation—a message from the Eiffel Tower, Paris. There is not a single broadcasting station in Belgium. The few scientific persons who have built receiving equipment depend entirely upon Paris, and Scheveiningen, Holland, for their entertainment. Such is the unique picture of aerial communication conditions in the little kingdom as pictured by L. Van Dyck, chief of the production branch of the Bell Telephone Manufacturing Company, at Antwerp, who has come to the United States to study methods at the Western Electric Company's factory, Chicago. "Belgium," Mr. Van Dyck declares, "has acquired the habit of looking to the United States for all suggestions in electrical matters. Once the radiophone has proved its feasibility as a commercial enterprise here, Belgium undoubtedly will take steps to adopt it."

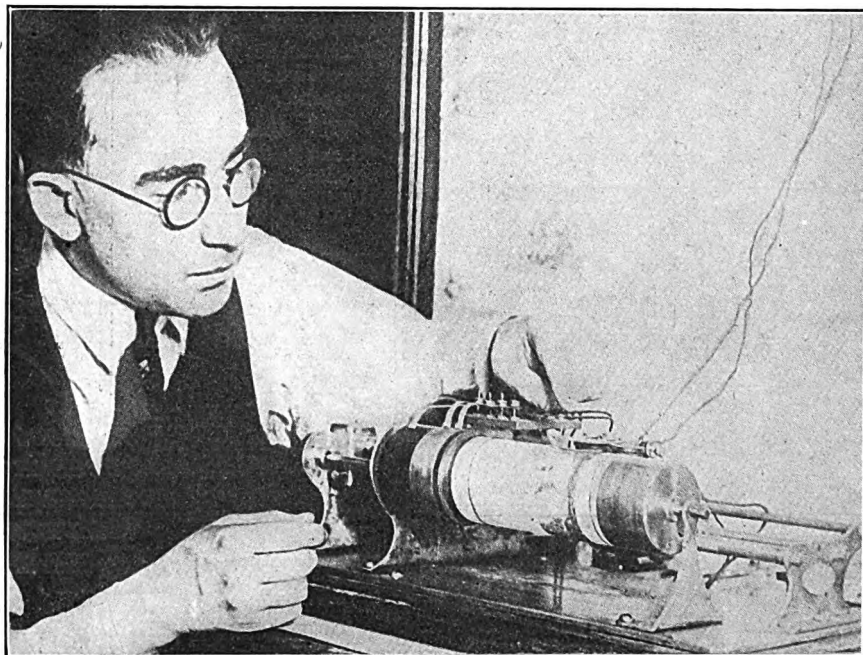
* * *

An unusual measure of international tribute has been paid to the engineering forces of the Western Electric Company. Coincident with the election of Frank B. Jewett, vice-president in charge of the company's engineering and manufacturing departments, to the presidency of the American Institute of Electrical Engineers, word has been received from the other side of the Atlantic of the selection of Frank Gill, European Chief Engineer of the International Western Electric Company, to head the institution of Electrical Engineers in Great Britain.

* * *

The radiophone and spinal anesthesia, two recent inventions—one electrical, the other surgical—enabled a girl in the Samaritan Hospital, Philadelphia, to undergo two serious operations, last week, and remain smiling throughout. The spinal anesthesia numbed the girl's body from her shoulders down. The radiophone transmitted to her the songs of McCormack, and the piano wizardry of Paderewski and other musicians. The experiment was conducted by Dr. John Howard Frick in an effort to alleviate the mental torture which his patient, a naturally nervous person, would have had to endure under the knife. During the first operation, for appendicitis, the girl remained oblivious of the surgeons. The radio receiver strapped over her ears, her only comment was that she could "hear perfectly" the strains of music coming through space. The second operation was for the removal of gall stones. Throughout it, the patient entertained the nurses with laughing comment on the "good execution" of the musician who was transmitting Chopin for her. She even offered occasional criticisms.

This Machine Radios Pictures



(C. Underwood & Underwood, N. Y.)

John Leichman, of Ogden, Utah, demonstrating his machine for the transmission of photographs by wire. The original photograph is placed on a drum on the machine and a sheet of white paper is placed on a similar drum at the receiving station. The impression is made by the sensitiveness of the vibrations. The face of a person photographed may be seen on Mr. Leichman's machine.

Mr. Garrick Defended

Editor, Radio World:—Well, Well! Looks as if Friend Garrick started something in Radio World, dated April 22. Maybe you are right, 2-tt; but you know he just said, "Westinghouse," so I took it for granted that he meant the "RC."

Now, as for you, Mr. Hoeveler, your letter makes me smile. You admit that you don't know anything about radio, but you have the nerve to write such a letter. I would suggest that you read 2-tt's letter and study radio a little more before calling a commercial operator narrow minded.

Do you suppose that a ship or land station is going to change their wavelength, or the amateurs change their 200-meter wave allowed them by the Government, just to please the "music listeners?" That statement of yours is pure foolishness. Very true, thousands of people enjoy the broadcast music, but is that any excuse for a dozen "would-be" broadcasting stations springing up every day? Why not have one good one in each State operating on a wave that won't be interfered with by telegraph signals? The amateurs get more complaints from these "parlor hams" about interference than they do from the big commercial stations handling hundreds of important messages every day.

I think you are one of those "birds," who, every time they hear a ship handling traffic with a coast station—probably relating to a ship in distress—say, "There goes another one of those amateurs with his 'da dit da.'" Did you know that there are times when thousands of lives on a ship at sea depend on those da dit das?

You also say, "If Mr. Garrick is such a clever radioman." Let me tell you one thing: If he holds a commercial operator's license, he IS a clever radioman.

Learn radio before saying that a real radioman has a cramped intellect.

My very best regards to Mr. Garrick. 2-tt, and all the "BRASS POUNDERS."—D. B. Fancher, Radio Station 1-BVB, Westerly, R. I.

Big Business Ahead

It has been stated in these columns before that radio has not as yet "struck its stride," says "The Evening Mail," New York. Several million American homes will have to be equipped before radio will have reached the zenith of its phenomenal growth. It will take many years for that.

The writer recently returned from a trip to the northern part of the State and he was surprised at the small number of radio aeriels he saw on the roofs of houses. Not one house in a hundred had an aerial on it. Interest in the radio was running high, and a great deal of apparatus was being sold by the dealers, but the great mass of the people had not yet reached the buying mood. That condition is general throughout the entire country.

Coming Events

The editors of **RADIO WORLD** will gladly publish news items of all contemplated radio shows and expositions. Keep us posted by making full information.

CHICAGO RADIO SHOW, Coliseum, Chicago, Ill., October 14 to 22. U. J. Hermann, managing director, 549 McCormick Building.

KANSAS RADIO EXPOSITION will be held at the Kansas State Fair, Hutchinson, Kansas, September 16 to 22 inc. A. L. Sponsler, secretary.

FIRST INTERNATIONAL RADIO EXPOSITION, Grand Central Palace, New York City, George Brokaw Compton, secretary. Date not set.

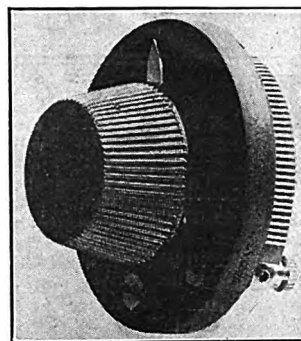
"RADIO DAY," Pittsburgh, Westview Park, August 24. Under auspices of Radio Engineering Society. C. E. Urban, secretary.

RADIO CLUB OF AMERICA. First autumn meeting will be held the last Friday in September. Renville H. McCann, secretary, Columbia University, New York.

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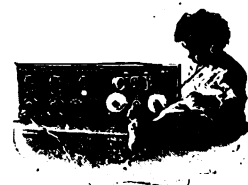
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The same care should be taken when purchasing Radio Parts as when buying a complete Receiving Set. De Forest Radiophone Parts are unequalled in quality of materials, workmanship and correctness of design. Insist upon De Forest when purchasing the following instruments:



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"Famous For Dependability"

BACK NUMBERS AND NEW RADIO WORLD READERS!

The publisher has reserved a limited supply of the first thirteen issues of **RADIO WORLD** for the benefit of new readers who want to become subscribers and have their files complete from the first issue. The first twelve copies will be mailed postpaid on receipt of \$1.50; or better still, subscribe now for six months (\$3.00), or twelve months (\$6.00 for 52 issues) and have your subscription start with No. 1. Radio World Co., 1493 Broadway, New York City.

Radio Merchandising

New Firms and Corporations

Notices in this department are considered as purely interesting trade news and published without compensation to us. We welcome trade news of this nature. All notices having an advertising angle are referred to our Advertising Department, and are placed under Classified Advertising at 5 cents a word, or as Display Advertising at \$5 an inch.

(The firms and corporations mentioned in these columns can be reached by communicating with the attorneys, whose addresses are given whenever possible.)

Radio Co., Manhattan; \$5,000; J. Oldak, M. Davis, R. I. Livingston. (Attorneys, Livingston & Livingston, 299 Broadway, New York.)

DeKady Radio Equipment Company. Manufacture electrical supplies. \$9,000. Harry B. Doyle, Mt. Vernon, N. Y.; Victor C. Kitchen, Great Neck, N. Y.; S. E. Darby, Jr., New York City. (United States Corporation Co.)

Natural Voice Radio Horn Corp., Manhattan; \$20,000; E. M. and E. A. Leet. (Attorney, W. V. Burke, 375 Fulton St., Brooklyn, N. Y.)

Beverly-Green Corp., Manhattan, radio outfits, 100 shares common stock, no par value; F. Raab, F. Demovitch, G. Schonberger. (Attorneys, Joseph, Demov & Feinstein, 277 Broadway, New York.)

Brownie Radiophone Co., John F. Dwiggins, manager, 81 Orchestra Place, Detroit, Mich.

Fairbanks Radio Corp., Brooklyn; \$10,000; S. and M. and J. Slegmund. (Attorney, S. Douglas, 922 Broadway, Brooklyn, N. Y.)

Norris Radio Corporation. Manufacture and sale of radio equipment. 300,000. C. Henry. P. D. Benson, A. B. Claffey, New York City (Colonial Charter Co.)

Radio Land Corp., Delaware; 10,000 shares preferred stock, \$10 each; 10,000 common, Class A, \$10 each; 30,000 common, Class B, no par value; rep., M. W. Waide, 127 West 53d st.

Paramount Radio Parts and Die Corp., 174 North St., New York, N. Y.

Northern Radio Supply Co., Manhattan; realty, \$10,000; E. A. London. (I. Weissberger & Leichter, 93 Nassau St., New York.)

Franklin Radio Corp., Philadelphia; manufacture wireless telephone; \$250,000. (U. S. Corporation Co.)

Bestophone Radio Corp., Manhattan; \$10,000; A. A. Lenick, I. Merzger, G. N. Sherman. (Attorneys, Perlman & Levitt, 15 Park Row.)

Millard Radio Corp.; apparatus; \$1,250,000; Theodore L. Ernst, S. E. Freeland, Samuel Baras, New York. (American Guaranty and Trust Co.)

Flash Radio Equipment Co., Manhattan; \$100,000; J. F. Siegel, O. C. Bryant. (Attorney, H. C. Harris, 291 Broadway.)

Simon Radio Corp., Delaware, to Rayphone, Manhattan.

British American Radio Corp., apparatus, \$2,500,000; Jacob H. Roberts, Edward B. Jordan, Jr., George H. Matthews, Hempstead, N. Y. (Philip L. Garrett, Wilmington, Del.)

Midwest Radio Corp., Wilmington, apparatus, \$500,000. (American Guaranty Trust Co.)

Mohawk Radio Mfg. Co., Manhattan, engineering and contracting, \$200,000; J. P. Aylward, E. Weinberg, E. J. Heght. (Attorney, J. J. Heght, 126 Liberty St., N. Y.)

Thresher Radio Corp., Brooklyn, \$100,000; A. A. Thresher, J. D. Smith. (Attorney, W. F. Smith, 39 Cortlandt street, New York, N. Y.)

Radio Cleartone Corp., 2072 Valentine avenue, New York City (Bronx), \$20,000; H. Meisinger, H. D. Danehy, F. Metz. (Attorney, B. J. Levy, 45 West 113th street, New York.)

North American Radio and Supply Corp., Wilmington, Del., airplane and radio supplies, \$100,000.

International Engineering and Radio Corp. of America, Wilmington, Del., equipment, \$100,000. (Colonial Charter Co.)

Tesh Radio Co., J. Fred, Tesh, manager, High Joint. N. C.

A Simple Variocoupler

A VARIOCOUPLER is an essential part of every radio set used for the reception of continuous wave transmission and in particular the broadcasting of telephone. It is the first step of transformation of the radio frequency, and in order that the reception may be brought into resonance, the instrument must be tuned to the proper frequency.

The Selector variocoupler differs from those now on the market in the feature that the selective tuning is all self-contained within the variocoupler itself. This is accomplished by the addition of the Selector, which is a selective contact switch, so inserted into the variocoupler that its control in this position is in the same alignment with the rotating means of the rotor section of the variocoupler, so that the aerial ground and rotor, or secondary control, are located in one spot on the surface of the panel of the set. This feature, from a mechanical point of view, is a great space saver and tends to a more harmonious and symmetrical design of the radio receiving set, a feature which every manufacturer today is striving to accomplish. From this point of view alone it is one of the most radical steps that have been accomplished.

Now from the point of view of discussion as to how it will benefit the amateur who builds his own set, we believe that this feature is most paramount. Every amateur who purchases a variocoupler is confronted with the very serious problem of its installation. That it necessitates the assembly of the two selective switches and the contact points which are now found on every set and their assembly and installation alone requires considerable skill. After these switches and points are assembled it then becomes necessary to exercise considerable skill and ingenuity, and the installation of the leads from the taps to the points as installed on the surface of the front of the set and in the assembly of the instrument represents about 40 per cent. of the wiring. It is a very troublesome job and in ninety cases out of a hundred it is never done satisfactorily.

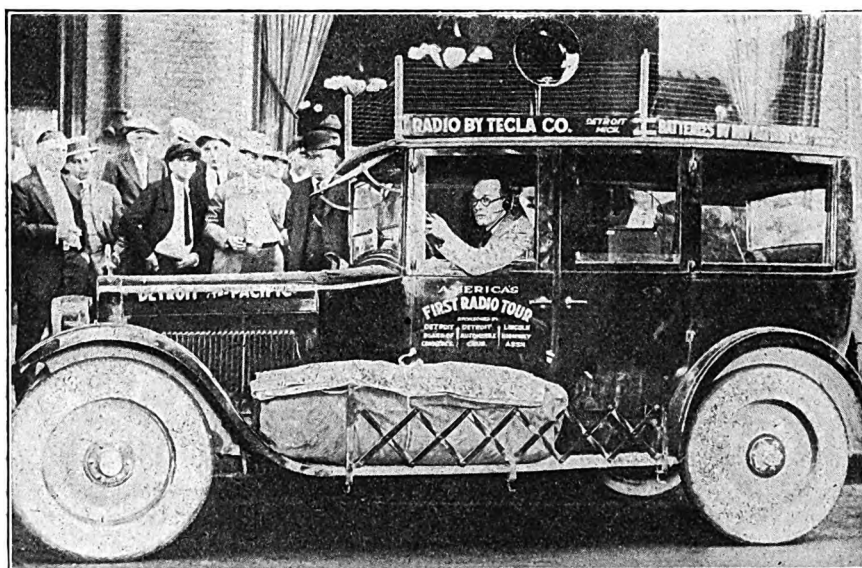
Work on New York City's Radio to Begin

ROVER A. WHALEN, Commissioner of the Department of Plants and Structure, has announced that actual work on the New York City broadcasting station, to be erected on the roof of the Municipal Building, will be commenced almost immediately.

The Board of Estimate has voted the sum of \$50,000 for this purpose, and Mayor Hylan, who proposed the idea, has complimented the members on their generosity. Plans and specifications are now being prepared and bids for the steel tower to support the aerials will be advertised in a few days. Only one steel tower will be used. The antenna will be attached to it and to the tower of the Municipal Building.

New York City, metropolis of the Western Hemisphere, is, therefore, the first city to erect its own broadcasting station. This is a bit of radio enterprise which, no doubt, will be an inspiration to other municipalities throughout the country. With New York City supporting its own broadcasting station, the entire country will be benefited, for the ether waves will carry the programs to many distant points.

"He Shall Have Music, Indeed"



(C. Pacific and Atlantic Photos.)

Are you radio touring this summer? They say it's simply grand! The latest thing out! So here we see Wallace Blood, of Chicago, his sedan car all "dolled up" with radio harness ready for a trip to the Pacific Coast, which, Mr. Blood says, is the first radio tour on record. The photograph shows the radio sedan, with Mr. Blood's hands on the wheel and the phone clamped to his ears, starting out from Chicago, ready to pick up the ether waves as he goes.

Radio Captains of Industry

No. 3—JOSEPH D. R. FREED

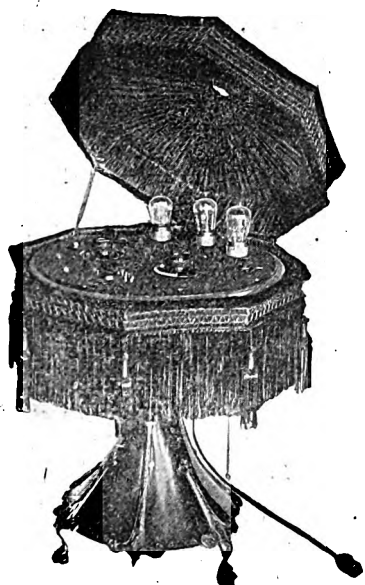
President, Freed-Eisemann Radio Corporation



(C. Kadel & Herbert News Service.)

What is claimed to be one of the most radical advances in radio is this miniature detector tube, which, requiring no batteries whatever to operate, is designed to replace the costly vacuum tubes used in radio outfits. Joseph D. R. Freed, president of the Freed-Eisemann Radio Corporation, is the inventor. He claims that, after years of careful laboratory research work, he has finally perfected a tube that will cost the radio fan very little money, yet will function perfectly. Mr. Freed was photographed holding a large vacuum tube, in general use, in one hand and the new miniature tube in the other. Note the difference in size.

The Radio Phonolier



THE Radio Phonolier combines, in one compact unit, a lamp, and a complete radio—phone, tuner, detector, two-stage amplifier and loud speaker.

Due to our scientifically designed "All-

Wave" coupler, the Radio Phonolier has a range of from 150 to 3,000 meters, no extra loading coils or other apparatus being necessary to hear the higher-powered broadcasting stations.

The Radio Phonolier is built of solid copper, and finished in bronze, silver or gold, with lamp shades of refined and subdued combinations to match or contrast with interior decorations.

The base of the lamp is the loud speaker, and contains an inner horn that increases the clearness and volume of tone amazingly.

The Radio Phonolier is all that the discerning artistic temperament can desire for reading or efficient broadcast reception, and is being produced for refined individuals who take pride in beautiful home surroundings, and who, at the same time, wish to enjoy the entertainments being broadcast by the many stations.

Trade Notes

A NOTICEABLE increase in the number of incorporations in New York State, reported by the Secretary of State's Department as an indication of a new confidence in the future of business, resulted in 1,683 companies, with a capitalization of \$60,379,139, taking out charters in May. In the first five months of 1922 there have been 952 more incorporations than in the similar period in 1921.

Of the companies embarking in business last month, 264 with a capitalization of \$13,776,000 are distributed over 43 counties outside of Greater New York. Radio supply companies continue to occupy a prominent place in the ranks of new ventures.

THE RECENT DEVELOPMENT and popularity of radio has afforded many manufacturers a new field for sales. One of these is the Post Electric Co., 30 East Forty-second street, New York City, manufacturers of the "Post Electric Pen." Professionals and amateurs alike have found this "pen" just the thing for soldering connections heretofore hard to get at with the ordinary large soldering-iron. The "Post Electric Pen" may be attached to any electric-light socket. It attains maximum heat in 45 seconds and makes the soldering of connections and loose parts as easy as writing with a pen.

Radio Booms Metal Trades

W. L. Chandler, President of the National Association of Purchasing Agents, in an interview, says that the metal trades have followed in the wake of the radio boom and show a great increase in orders during the past two months. A great demand has developed for strip and ribbon metals which are used extensively in the manufacture of radio equipment.

1,717 Radio Companies in New York

New York State records show that 1717 radio companies were incorporated in the month of March, 1922. A summary issued by Secretary of State John J. Lyons, shows that an aggregate total capital of \$58,411,250 is represented.

Will All New Firms Join This List?

G. F. Johnson, 625 Black Ave., Springfield, Ill.
 DX Radio Co., Summit, Ill.
 Ideal Apparatus Co., 1901 E. Louisiana St., Evansville, Ind.
 Alamo Sales Corp., Indianapolis, Ind.
 Indianapolis Radio Supply Co., 3023 Boulevard Place, Indianapolis, Ind.
 Radio Service Organization, Logansport, Ind.
 The Radio Shop, Union City, Ind.
 Burgess Elec. Co., Duluth, Minn.
 Chas. A. Anderson & Co., 430 2nd Ave., S., Minneapolis, Minn.
 Findley Electric Co., Minneapolis, Minn.
 Radio Equipment & Mfg. Co., Minneapolis, Minn.
 Sterling Elec. Co., Minneapolis, Minn.
 Berggren Electric Co., 436 Gilfillan Bldg., St. Paul, Minn.
 Pioneer Electric Co., St. Paul, Minn.
 Central Radio Co., Independence, Mo.
 Central Radio Co., Inc., 575 Grand Ave., Kansas City, Mo.
 McCreary Radio Supply Co., 4th and Delaware Sts., Kansas City, Mo.
 Western Radio Co., 6 W. 14th St., Kansas City, Mo.
 Benwood Specialty Co., 13th & Olive Sts., St. Louis, Mo.

Linze Electrical Supply Co., 1127 Olive St., St. Louis, Mo.

Missouri Radio Supply Co., 4623 Maryland Ave., St. Louis, Mo.

H. & M. Radio Equipment Co., Akron, O.

Athens Radio Co., Athens, O.

Electric Motor & Eng. Co., Canton, O.

Wireless Mfg. Co., Canton, O.

Radioelectric Shop, Cleveland, O.

Reliable Radio Parts Co., 11419 Durant Ave., Cleveland

The Amolecco Co., Cincinnati, O.

Ano Radio Mfg. Co., 218 W. 12th St., Cincinnati.

Cino Radio Mfg. Co., 218 W. 12th St., Cincinnati.

Craig & Loughborough, Norwood, Cincinnati.

Mid-West Radio Co., 3423 Dury Ave., Cincinnati.

Milnor Elec. Co., 129 Government Sq., Cincinnati.

Precision Equipment Co., Peeble Corner, Cincinnati.

Reuter Elec. Co., Cincinnati.

Electrical Specialty Co., 48-50 S. Front St., Columbus, O.

L. J. Lease, Delaware, O.

Wm. Hall Elec. Co., Dayton, O.

American Radio Sales & Service Co., Mansfield, O.

B. S. Sprague Elec. Co., Marietta, O.

Dewey Sporting Goods Co., Milwaukee, Wis.

Meter Electrical Construction Co., Oshkosh, Wis.

D. & F. Kusel Co., Watertown, Wis.

Western States:

Reynolds Radio Co., Inc., 613 19th St., Denver, Colo.

Winner Radio Corp., 1710 Glenarm Pl., Denver, Colo.

Henry Francis Parks, Butte, Mont.

Northwestern Radio Mfg. Co., 1556 E. Taylor St., Portland, Ore.

Stubbs Elec. Co., 6th at Oak St., Portland, Ore.

The Bon Marche, 2nd Ave., Pike and Union Sts., Seattle, Wash.

Northwestern Radio & Elec. Co., 418 Union St., Seattle, Wash.

Northwest Radio Service Co., 1637 Westlake Ave., Seattle, Wash.

Williamson, Elec. Co., Seattle, Wash.

The Radiomart Co., 1236 American Ave., Long Beach, Calif.

Brode Elec. Co., Los Angeles.

Manual Arts Radio & Elec. Shop, 4154 S. Vermont Ave., Los Angeles.

Southern California Elec. Co., Los Angeles.

Standard Radio Co., 1048 S. Olive St., Los Angeles.

Western Radio Elec. Co., 550 S. Flower St., Los Angeles.

The Wireless Shop, 1262 West 2nd St., Los Angeles.

Radio Dept., Y. M. C. A., Los Angeles.

Montebello Radio Shop, Montebello, Calif.

Warner & Linden, 22nd and Telegraph Ave., Oakland, Calif.

Altadena Radio Laboratory, 32 W. Colorado St., Pasadena, Calif.

J. J. Dunn, Pasadena, Calif.

David Radio Supply Co., R. A. Box 388, Reedley, Calif.

Hobrecht's, 1014 6th St., Sacramento, Calif.

Harry A. Snyder, 337 F St., San Bernardino, Calif.

Southern Electrical Supply Co., San Diego, Calif.

Herrold Laboratories, 467 S. 1st St., San Jose, Calif.

The Radio Shop, San Jose, Calif.

Atlantic-Pacific Radio Supply Co., 633 Mission St., San Francisco.

California Elec. Supply Co., 643 Mission St., San Francisco.

HOMCHARGE YOUR BATTERY for A Nickel

No muss, trouble, dirt—no moving of batteries—loss of time—no effort on your part—no technical or professional knowledge needed.

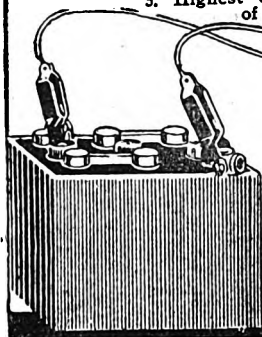
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successfully meets all charging conditions, and is the only rectifier combining the follow-

ing essential Homcharging features:

1. Self-polarizing. Connect battery either way and it will always charge. No danger of reverse charging, ruined battery or burnt-out rectifier.
2. No delicate bulbs to break or burn out. Only one moving and two wearing parts. These are replaceable as a unit, after thousands of hours' use, at small cost. Cannot be injured by rough handling.
3. Operation stops and consumption of current ceases immediately upon disconnecting battery.
4. The only charger costing less than \$100.00 that will fully charge a battery over night. Gives battery a taper charge—exactly as recommended by battery manufacturers. Guaranteed not to harm your battery even though left connected indefinitely.
5. Highest efficiency of any three or six cell charger made.
6. No danger of fire.

Approved by Underwriters. Immediate Delivery. Attention Motorists. Will charge your auto battery as well as radio battery. Send for Bulletin No. 58 for further information. For sale by all radio, electrical and accessory dealers or shipped, express prepaid, for purchase price, \$18.50. \$20 West of Rockies.



The Automatic Electrical Devices Co.

135 WEST THIRD STREET CINCINNATI, OHIO
BRANCH OFFICES—New York, Chicago, Pittsburgh,
Los Angeles, New Orleans, Detroit, Toronto, Phila-
delphia, Baltimore, Dallas.

Radio and Wire Phones Not Alike

AFTER considerable study the telephone engineers have come to the conclusion that radio and wire telephony have entirely different fields and functions which do not conflict, says "The Radio Digest."

The natural characteristics of radio and wire transmission are fundamentally different. One of these systems performed a duty for which the other is unsuited, and each is supplementing the other to the end that all important needs for communication are being provided for as rapidly as they arise.

The use of wires is necessary for handling the large amounts of traffic on land, which must be done with certainty and minimum of cost. We can plainly see where radio will render a service of the greatest value for communication over wide stretches of water, with moving conveyances generally, for a host of maritime and military purposes and for the broadcasting of information. It would appear that these fields mentioned are the ones in which the radiophone will be of greater importance.

It has often been said that, had the course of scientific development been reversed so that radio transmission preceded transmission by wire, the discovery that wires can be used to guide the ether waves would be considered one of the marvels of science. By their use, the otherwise uncontrolled ether waves are caused to follow predetermined pathways, flashing thousands of messages, whether up through the intricate structure of a thirty story office building, or out across the plains, under rivers and over mountains, to the far side of the continent, there to be received by him—and him alone—for whom it was intended.

Charles E. Hayes Co.

Wholesale Distributors of
**Radio and Electrical
Supplies**

32-34 TAYLOR STREET

SPRINGFIELD

::

::

MASS.

Telephone: River 3515

Ode to a Bulb

I T'S far from a thing of beauty, I know,
But for wonder it hasn't a mate—
I'm speaking now of that little glass tube
With filament, grid and plate!
They cost like the devil, but still we buy;
We'll have them whate'er the rate,
For you can't do much sans the little
glass tube
With filament, grid and plate!
It puzzles us all as to just how it works.
But knowledge will come if we wait,
And some day, perhaps, we'll know all
about
The filament, grid and plate!
You'll put your galena in a box,
And for money your folks you'll bait
Till they "come through" with sufficient
jack
For a filament, grid and plate!
And when you have a tube in your set
You'll turn down date after date,
For your only love, my lad, will be
A filament, grid and plate!

EPILOGUE

Of all the things that we don't like,
Our most particular hate
Is to burn out one of those doggone tubes
With filament, grid and plate!
—Detroit News.

No Free List

RADIO WORLD has no free list. The only copies sent out by the publishers are to fill the ever-increasing orders of the American News Company, the large numbers of subscription orders received at the office of publication, and one voucher copy to each advertiser and advertising agent represented in current issues.

RADIO WORLD, 1493 Broadway, N. Y.

KEYSTONE VARIABLE CONDENSERS

21 Plate
\$3.55

43 Plate
\$4.50

Our selection of materials and built-up type design give assurance of low energy loss and high efficiency.

Agents and Jobbers write for information

KEYSTONE MOTOR COMPANY
OAKS, MONTG. CO., PA.

EVERYTHING IN RADIO

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RADIO WILL MAKE YOU MONEY

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ALL CAPITAL STOCK—

No preferred shares or bonds
Price Advancing Rapidly

Factory, offices and demonstrating rooms, Testimonials open for inspection. Strictest investigation invited. Call or write for information.

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NOW EASY TO GET EXPERT RESULTS IN RADIO~



YOU can now get one real authority on radio subjects—how to enjoy the daily programs in your own home; what kind of aerial to put up—how to operate your set to best advantage—the correct way to comply with underwriters' rules—every phase of radio, technically correct in everyday language. This one authority is the Lefax Radio Handbook, compiled by the heads of the United States Radio Laboratory with all the unlimited resources of the Government at their command. It's written in language so easy to understand that anyone, with Lefax help, can get expert radio results.

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RADIO HANDBOOK

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Sherlock Holmes Has a Rival

WILLIAM J. BURNS, chief of the Department of Justice Bureau of Investigation, told a story recently in which radio took the part of Sherlock Holmes, says "Radio." A dapper young man appeared before the sales manager of a radio-manufacturing plant, and explained that he wanted to purchase a fine receiving set for a local high-school. He was greeted cordially and the best of the house's set was demonstrated. Ordering an expensive set, he managed, somehow, to secure delivery without payment, and then disappeared. The set also vanished from the place it had been shipped to originally, much to the chagrin of the manufacturers, who decided to advertise their loss through radio itself, being able to give a very accurate description of the young man.

Chapter two opens in an apartment where a genial and fine-appearing young man, with a scar on his cheek, is entertaining his friends with a new receiving test. Suddenly the instrument begins to tell of the manufacturer's loss and give a detailed description of the thief—unmistakeably the host! The consternation of the guests may be imagined. The next morning a very worried mother paid for the instrument which her son had wanted so badly, whereupon the manufacturer dropped the matter.

Wave Length Conserva- tion

The wave-length problem is growing more serious daily. The supply of available commercial wave lengths is being rapidly depleted, says *The Mail*, New York. Unless something is done, the development of commercial radio will be seriously hampered. In this connection, it is interesting to note that the nations of the world have decided on a sane policy of cooperation rather than an insane policy of competition. Last year Germany, France, England and the United States planned to erect trans-oceanic stations in Argentina. All preparations were made. Four stations were to be erected to do the work of one, and four precious wave lengths were going to be wiped off the list. American engineers and officials suggested a conference. The representatives of the other nations agreed, and the matter was discussed about the conference table. It was finally decided to build one international station in Argentina in place of four independent stations. Thus three wave lengths were saved, to say nothing of much human effort and several millions of dollars capital.

Fatigue Measured with Vacuum Tube

A German scientist, Professor Hoeber of Kiel, is using the vacuum tube to "listen in" on the operations of the human body, says the *Mentor Magazine*.

With the aid of the versatile bulb that made the radiophone possible, he is able to measure human fatigue. Every vital function, the movement of a muscle or a nerve, results in the generation of an infinitesimal current of electricity. This is detected and amplified until a whole class of students can hear the noise produced in a telephone by the movement of a frog's leg. As the muscle becomes fatigued the current, produced gradually, becomes weaker and the sound fades away.

Subscribe direct or through your news dealer. \$6.00 a year, \$3.00 six months, \$1.50 three months. Radio World, 1493 Broadway, N. Y. C.

Radio Set Complete

Enjoy Daily Concerts, Weather Crop and Sporting News

Complete Outfit \$12.75
Including 2,000-ohm Phones
Immediate Shipment.

Can be installed in 30 minutes
by any one.

Full instructions with each set.
Send check or money order to

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2908 Woolworth Bldg. New York
Selling Agents Wanted.

86,960 NAMES

Increase your sales by using names and addresses of firms and individuals interested in everything in Radio.

310 Radio Manufacturers in the U. S. \$3.00
650 Radio Supply Jobbers in the U. S. 5.00
6,500 Retail Radio Dealers in the U. S. 35.00
5,000 Amateur and other owners radio apparatus 10.00
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Amateur Radio Directory of the U. S. Complete list of Amateur stations with names and addresses of operators or owners. Priced for \$3.00. Names and addresses are guaranteed 98% correct will refund postage on all mail returned as undeliverable if less than 98%. Remit with order.

SUBSCRIPTION AGENCY

1021 Carrington St. Janesville, Wis.

Special! Special!

21 plate Var. Condensers—
regular price, \$3.55, now....\$2.80

43 plate, regular price, \$4.50—
Now\$3.75

Highest grade Panels cut to your measure, 3/16 thick, .02 per sq. inch, 1/8 thick, .0134 per sq. inch.

POTTSTOWN RADIO SUPPLY COMPANY

228 High St. Pottstown, Pa.

"GET THIS"

We have accumulated a surplus of Dials which we have to sell immediately, and to dispose of them quickly we will sell them at

3 for \$1.00

The specifications are: 3 1/2" diameter, highly polished finish, graduations 1 to 100 in half circle marked in white enamel, knurled knob with set screw for 1/4" shaft. Very neatly designed. At this price quick action is necessary. A few hygrade Rheostats with metal dial attached, \$1.00 each.

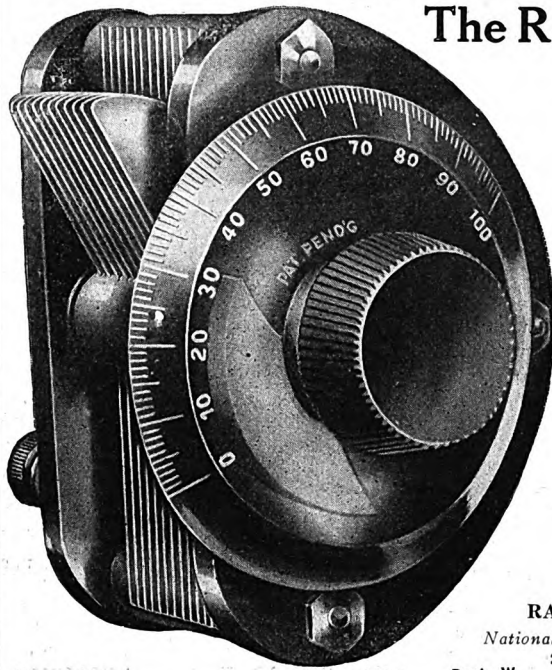
NATIONAL RADIO CO.
Shelton, Conn.

QUESTIONS and ANSWERS

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Latest broadcasting map 15c. That is, a complete broadcasting map appeared in Radio World, No. 8, dated May 20. Mailed on receipt of 15c. Radio World Company, 1493 Broadway, N. Y. C.

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CONDENSER



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Type VC-1

Dept. W.

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Brass Studs Through Aluminum
Plates and Die Cast.

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In No Instance Is Insulating Material
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Best Engineering Design.

23 Plate. .0005 mfd. \$4.25 List
Max. to min. capacity, ratio 12 to 1
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Max. to min. capacity, ratio 22 to 1

Complete with Knob, Dial and
Counter weight. Each packed in
individual carton.

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NEW YORK CITY

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their order, is automatic acknowledgment of their
subscription order.

Advertising rates on request.

Entered as second-class matter, March 28, 1922,
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IMPORTANT NOTICE:

While every possible care is taken to state
correctly matters of fact and opinion in technical
and general writings covering the radio field, and
every line printed is gone over with a scrupulous
regard for the facts, the publisher disclaims any
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patents, priority of claims, the proper working out
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AND CALL BOOK

Which has a Complete List of all the Amateurs, Special Amateurs, and
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ALSO

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Radio Relay Tryout.

THE Radio Section of the Signal Corps
intends to try out an automatic relay
at Chicago, controlled from Washington,
thus enabling the Capital station to con-
trol traffic through Chicago West, prob-
ably as far as Omaha. If the circuit
works well, it is also planned to instal
a similar relay at Omaha and to operate to
the Far West from Washington by
means of the 20-k.w. set at Arlington,
Virginia. Omaha will be advised when
the messages are to be relayed through
their station and will stand by, letting
Washington work through the relay to
Salt Lake City or even farther west.

Last month the Radio Section of the
Signal Corps handled 5,232 official mes-
sages numbering 175,672 words, and
equaling a saving of approximately \$2,718
over what the cost would have been by
commercial lines.

—NACO—

Radio Receiving Sets \$20.00

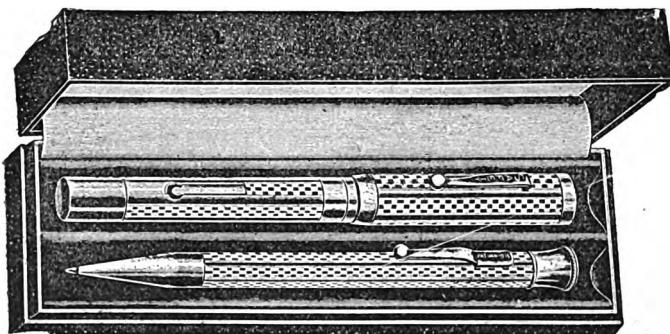
Scientifically built to insure depend-
able service under exacting condi-
tions with which radio communica-
tion has to meet. For clear hear-
ing and pleasing tone use a Naco
set.

Naco Radio Accessories

Telephones, Knock-Down Sets,
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STATE MANAGERS WANTED

National Motor Accessories Corp.,
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Special Offer TO Radio World READERS

RUSH your name and ad-
dress and we will tell you a cent.
HOW you can get this hand-
some 14k. Gold Filled Foun-
tain Pen and Pencil Set.

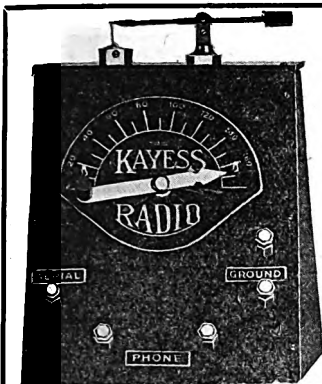
Absolutely Free

REMEMBER, with our plan
it WON'T cost you a cent.
The set comes to you in an
elaborate plush box. Fill
out the coupon herewith and
mail at once for our FREE
PLAN.

Publisher's Promotion Bureau, 120 Patchen Avenue, Brooklyn, N. Y.
Gentlemen: Without any obligation on my part, please send me particulars
of the above offer.

Name
Street City

Fifty-two issues for \$6.00. Sub. De-
partment, Radio World, 1493 Broadway,
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This is the K-S crystal receiving set you hear them all talking about. This is not a cheap set, the best that skill and engineering can produce.

List with Phones
\$18 Each

Without Phones
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Attractive Discounts
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No Lightning Arresters.
No Outside Grounding.
No Danger from Lightning.
Both Windows can be Opened or Closed.

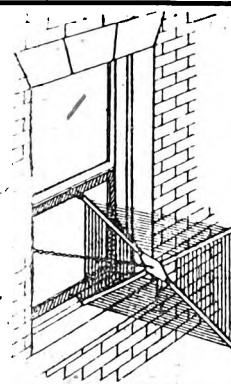
Fits Any Window
up to 48" Wide.

LIST PRICE

\$10

Dealers

Write for Discounts.



ANNOUNCING STANRAD ADAPTER

for the RAOB-Meyers-tube. Enables the Amateur to use the above tube in the standard socket. Price \$1.25 P.P.

Orders filled in order received.

STANRAD PRODUCTS CO.

West Winfield, N. Y.

Another Radio Pioneer

HARRY PHILLIPS DAVIS, vice-president of the Westinghouse Company, entered his office one morning in September, 1920, with an idea. The idea had come to him while reading the advertisement in his evening paper. In a corner of a full page ad, he came across the words, "Mr. Conrad will send out phonograph records this evening." This advertisement was in the interest of the store's amateur radio department and was explaining to local radio amateurs that Mr. Frank Conrad, who had operated his station intermittently since the war, would send out by radio phonograph records on a certain evening. The Conrad station was very well known to amateurs all over the country, for it was one of the few amateur stations licensed to operate during the war. This special operating was in the interests of government research work which the Westinghouse Company was doing and also to test some apparatus.

Dr. Davis could not forget his idea. He was struck with the fact that the radiophone fundamentally did not lend itself only to private communication but that it had a universal field of usefulness and that through it, one could communicate with hundreds, thousands or millions; all could listen who had the suitable "ear," for if a certain class of people were interested enough to listen to music from a few phonograph records, there was a possibility of increasing this small audience of radio listeners to an enormous number by sending out entertainments, current events, etc., in a regular and interesting manner.

ATTENTION

Radio Manufacturers!

Manufacturers' outlet for New York and vicinity. Large experienced sales organization. Let us be your eastern representative.

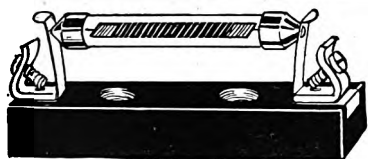
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329 East 29th Street New York City

—A L-O-U-D S-P-E-A-K-E-R

in a jiffy so all can hear by using the "PHONE-ADAPTOR," fits Edison, Victor, Sonora, Columbia and Pathe phonographs. Threaded to fit the leading makes of headphones. Specify make of phonograph and headphones you have. Satisfaction guaranteed or money promptly refunded. Sent postpaid anywhere. Nickel finish \$1.00; Gold finish \$1.35. **SEND FOR YOURS NOW.** Dealers write for literature and attractive discounts.

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'PRECISION' GRID LEAKS and MOUNTINGS

Resistance Ranges from
.05 megohms to 5. megohms.
Accuracy Guaranteed.

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Radio Needs Trained Men

Radio is sweeping the country like wild fire. Thousands of dollars are being spent for expensive outfits. **RADIO EXPERTS** are needed everywhere to keep this equipment in order and to sell and install new outfits.

Be a Radio Expert

I will train you quickly and easily in your spare time, to become a **RADIO EXPERT** so you can install, construct, repair and sell Radio equipment. I am a **Graduate Electrical Engineer** and from actual experience I will give you exactly what you must know to make the really **big money** in radio.

FREE My Consultation Service to you is **FREE**. This outside help which I gladly give you is, in itself, worth more than the small cost of the Complete Course.

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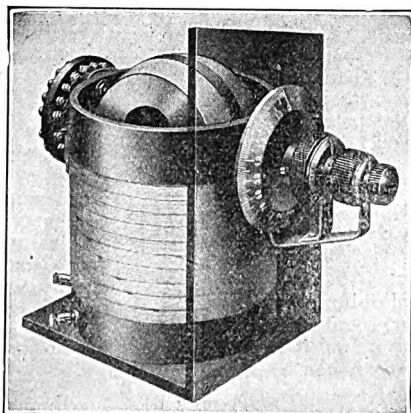
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The above instrument comes to you completely assembled, ready to wire; all parts mounted on genuine Formica Panel, set in quartered oak cabinet with hinged cover. Panel is properly shielded so that no "body effects" are experienced with this instrument.

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Broadcast Bill's Radio-lays

By William E. Douglass

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THERE ain't no month the whole year 'round I like as well as June; when spring with all its rain is past an' summer comin' soon. The trees and fields all dressed in green, the whole world seems to smile; most everyone likes June I guess, leastwise it's just my style. One reason why this world seems bright, it ain't just cause its Spring, it's cause that chap the other day sold me this wireless thing. He handed me some happiness all done up like a present, a shiny little package that is makin' my life pleasant. Now folks 'round here say listening is the only thing I do I like to know what's goin' on, an' all the stuff that's new; so now, when dinner's over I kin lay around an' hear what's doin' in this land of ours, in places far an' near. A lyin' in my hammock there so calm an' peaceful-like I hear the



"It's radio, of course!"

latest baseball scores or 'bout the miners' strike, how Carpy knocked out Lewis, gosh that must a been a peach, I'm mighty doggone glad I wasn't there within his reach. They told us 'bout a woman whose husband liked baseball, it seems that he neglected her which pleased her 'not at all, an' so she up an' leaves him—she's a "baseball widow" now. Next think I know on this here farm there's goin' to be a row; my better half is thinkin' now of gettin' a divorce—to all her friends I s'pose she'll say, "It's radio, of course." The people here in Brussels Sprouts don't know the war is over, the only thing they think about is sowin' oats and clover; an' when I try to tell em, that they're awful out of date, they turn their noses up an' say, I'm addled in the pate. Now folks I'll leave it up to you, don't happiness come first? An' I ain't happy 'less I hear what's new; it's like a thirst that some has got for homemade hootch, for me it's information that keeps my spirits in a state of sorter mild elation.

Do you know that the radiophone business has increased 60,000 per cent within a year? The demand which called it into existence is as tremendous as it has been sudden.—"The Radio Digest."

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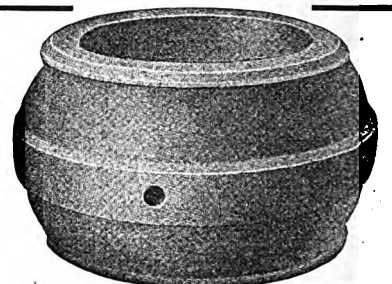
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If you happen to have a few copies on hand, keep and display them and you will find that they will sell. Very shortly it will be impossible to get back numbers of these earlier issues.

Radio World, 1493 Broadway,
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Made in our custom shops after your order is received. We ship ordinarily in 2 or 3 days. Perfect fit guaranteed when correct name, year and model of car is given. You can easily apply it yourself. We furnish instructions and all necessary tacks, welts and fasteners. Our Catalog No. 10 with samples is free—for the asking. **LIBERTY TOP & TIRE CO., Dept. R2, Cincinnati, O.**

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RADIO DEPARTMENT**Signal Systems Service Co.**

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The Great Radio Query

Here is the great question mark of the industry: Will it be possible to develop sending sets or transmitting sets that can be carried by the individual? This is asked by J. Hannaford Elton, in "The Illustrated World." Radio experts believe it will; that is, they believe that small sending sets of limited range, yet possessed of power enough to throw messages to the nearest transmitting station for relay to destination, will be perfected within the next year.

Whether the final development—the dream and goal of the radio industry—will ever be reached is at present problematical. That dream is simply this: that a type of multiple-transmitter be developed which will permit messages thrown by individual sets to be caught by the central transmitting stations and multiplied in power a thousandfold and hurled forth to travel around the world, if necessary. And the dream is that it shall be done automatically. This does not mean relayed, but simply increased in power so that the original message will be sent from the powerful transmitting station simultaneously with the broadcasting of the message from the individual set. When this stage is reached, wireless telephony, or "radio," as popular usage now has it, will know no limitation.

A Prediction for March 4, 1924

The inaugural address of the next President will undoubtedly be heard by the people of the country by radiophone. The Borough of Queens, New York City, is considering the installation of a municipal station. On every hand there are signs to show that the broadcasting of the future will be conducted as a governmental function, or at least as a governmentally regulated monopoly.

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This department is intended for everybody who wants quick action on short announcements covering the buying, selling, exchanging or general merchandising in the radio field. Readers of RADIO WORLD will find that it pays to read these columns every week. Advertisers will get a ten-day service here—that is, copy received for this department will appear in RADIO WORLD on the news-stands ten days after copy reaching us.

The rate for this RADIO WORLD QUICK ACTION CLASSIFIED AD. DEPT. is 5c. per word (minimum of 10 words, including address), 10% discount for 4 consecutive insertions, 15% for 13 consecutive insertions (3 months). Changes will be made in standing classified ads., if copy is received at this office before 4 P. M. on any second Tuesday preceding date of publication. RADIO WORLD CO., 1493 Broadway, N. Y. C. (Phone, Bryant 4796.)

Exchange jolly interesting letters through our Club! Stamp appreciated. Betty Lee, 4254 Broadway, New York City.

Mailing Lists—Canadian radio operators' addresses \$4 per 1,000. Atelier Trade Service, London, Ontario.

For Sale—Regenerative Receiver, Tubes, Batteries, Detector Two Step with Phones. Sell cheap. E. Schuessler, 2209 Wheeler St., Cincinnati, Ohio.

RADIO CABINETS—With all good tone chambers, with or without phonograph combination. Any quantity in stock sizes or in order. Columbia Mantel Co., 175 Powers Street, Brooklyn, N. Y. Tel. Stagg 2726.

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AGENTS WANTED in every city and town to sell standard radio apparatus. Attractive discounts given. If interested, write at once, stating age and radio experience. Wilmington Electrical Specialty Co., Inc., 912 Orange Street, Wilmington, Delaware.

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To many anxious inquirers. RADIO WORLD has no free list. One copy is sent as a voucher to each advertiser or advertising agent represented in current issues. All other copies are paid for on subscription or through the news trade.

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Enclose Self-addressed Envelope and receive free bulletin of various designs from which you may build your own Receiver from our blueprints. The blueprints show full constructional details, wiring diagram, bill of material and necessary data, and we guarantee the performance of the model. Price of blueprints varies as to subject desired. Ask for bulletin No. 349. Experimenters' Information Service, 220 West 42nd St., New York City.

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Special Broadcasting Receiving Sets, Crystal and Audion, Radio, Audio Frequency and Power Amplifiers, Loud Speakers and complete line of parts. Complete details on request. LEE RADIO CORPORATION, HADDONFIELD, NEW JERSEY.

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No. 1—100 ft. No. 14 antenna wire; 20 ft. No. 14 insulated ground wire, 1 ground clamp (solid copper); 1 single pole double throw lightning switch. No. 2—1 8 by 3/4 inch insulated tube, wound with enameled wire; 2 slides and 2 brass rods to fit; 4 nickelplated brass binding posts. No. 3—2 60c. switch-levers (1 1/2 inch); 20 contact points with nuts; 4 stops, 4 binding posts, 1 detector stand (unmounted). No. 4—1 set of 4 radio tubes, 8 inches long by 3-3/4—4-4/4 dia.; one spool No. 24 cotton covered wire, 375 feet; one wood rotor. Enclose Money Order or Checks, but no stamps. Brilliantone Radio Products, 874 Columbus Ave., at 103rd St., New York.

BARGAIN — Portable Radio Receivers, with phones and aerial, \$18. Seikel Ream Laboratories, Dover, Ohio.

New Westinghouse Senior, complete, regular \$75.00 at \$60.00; less antenna, \$50.00. Murdock phones, new, \$4.25. Write for other specials. D. G. Fox 20 Fernwood Ave., Haverhill, Mass.

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SALESMEN WANTED—Resident. In various localities. Standard, basic radio parts to Jobbers and Dealers. Splendid opportunity for men able to show past selling record and references. The R. C. Mills, 30 E. 23rd Street, New York City.

WANTED AGENTS—Be our representative in your town for the Olive Unipolar Phone. Big commission. Guaranteed article that sells fast. Write or wire for details. Meridian Radio Company, 430 Jefferson East, Detroit, Mich.

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High Grade Antenna Wire. Best quality 7 strand No. 22, tinned copper, non-corrosive antenna wire. Only 1c. per foot. The Kehler Radio Laboratories, Dept. W., Abilene, Kans.

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Latest broadcasting map 15c. That is, a complete broadcasting map appeared in Radio World, No. 8, dated May 20. Mailed on receipt of 15c. Radio World Company, 1493 Broadway, N. Y. C.

Steering Ships by Microphone

WHILE the World War was in progress, the location of enemy ships by measuring the distance of his batteries by means of sound was carried to a high degree of perfection. Recently successful experiments

have been made to apply this principle to steering ships in dense fogs and off dangerous coasts. According to a German publication, "Zeitschrift des Vereins Deutschen Ingenieure," this is accomplished as follows:

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"The ship inquires its position by wireless from the coast station. The latter thereupon requires it to make a sound signal which is received by a series of microphones distributed along the coast. These microphones are connected by wire with some sort of indicator apparatus, such as an oscillograph. It is possible to cover a stretch of coast from 20 to 30 miles long in this manner. The sound signals are magnified to the required degree and the oscillograph records the time intervals between the signals from the various microphones, so that they can be read instantly even when only a hundred to the second apart. Distinct signals from three microphones suffice to indicate the location of the ship. In a recent test a point 4 1/2 miles distant from the Kiel Canal was measured with a precision within 100 feet."

Radio Inventor Honored

THE use of buried antennae as a substitute for aerials supported by high towers, was discovered by Dr. J. Harris Rogers, who was recently honored by a visit from General Pershing, as photographed on page three of RADIO WORLD this week. Dr. Rogers also invented the method of communicating by radio with a submerged submarine.

Your Opportunity To Profit

because of the Tremendous Wave of Radio Enthusiasm now Sweeping over the World, is at hand.

"Sparks," a publication devoted to the outlook for the

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an established, growing concern, clearly outlines the Profit Possibilities of the company's shares.

Send for "Sparks" at Once.
There is no charge.

Industrial Expansion Service
No. 1674 Broadway New York

Radio Sermons for Churches Without Pastors

IN Louisiana the initiative is being taken in applying in a way that may become universal radio. This is the broadcasting of sermons from a church, to be received by congregations of numerous small churches at a distance. The church that is about to start this is the First Baptist Church at Shreveport. Science and Invention, New York, says:

"The station will have a normal radius of 1,500 miles, but under favorable conditions may be picked up from coast to coast, and by ships at sea. It will use a 200-watt set, sending on a 360-meter wave-length.

"Sermons, lectures, choir and congregational singing, organ recitals, chime concerts, and a daily news service will be among the features available to those having receiving sets. The auditorium, the largest in the city, will be used as a civic center, and the world's most noted singers and lecturers will be heard here. Their programs and lectures will be broadcasted.

"Several hundred small churches throughout the Southwest, most of which have no pastor, are installing receiving outfits, and their congregations will worship with the congregation of the Shreveport congregation."

Standard Tests for Receiving Sets

THE Bureau of Standards and the Electric Testing Laboratories of New York have approved, in outline, a standard method of testing complete radio-telephone receiving sets. The method is said to be for immediate use in testing sets manufactured for receiving radio telephone broadcasting, but details have not yet been made public. Improvements on the method used in testing the equipment submitted by the National Retail Drygoods Association will be subject to the approval of the Bureau of Standards, the Bureau cooperating with the Electric Testing Laboratories in establishing these methods as standard procedure.

Radio Club Notes

THE secretaries of the following radio organizations have filed the names of their clubs with RADIO WORLD. All other clubs are invited to send in their names and addresses, and the name of the officer to whom membership application should be made:

The Boys' Radio Club of Alameda. Organized June 10, 1922. Barton Cuyler secretary, 2527 Central Avenue, Alameda, California.

If you were not able to get the first twelve issues of RADIO WORLD, your newsdealer can probably get the copies through his wholesaler, or copies will be mailed from this office direct, at 15 cents per copy. RADIO WORLD CO., 1493 Broadway, New York, N. Y.



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Two-Step Amplifier Unit..... 35.00
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3-inch Dial for above.....\$1.00

Atlas Variable Condensers

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23 Plate Variable Condenser.....\$3.50
3 Plate Variable Condenser.....\$1.50
Phone Condenser (Fixed).....20c
Grid Leak Condenser (Fixed).....20c

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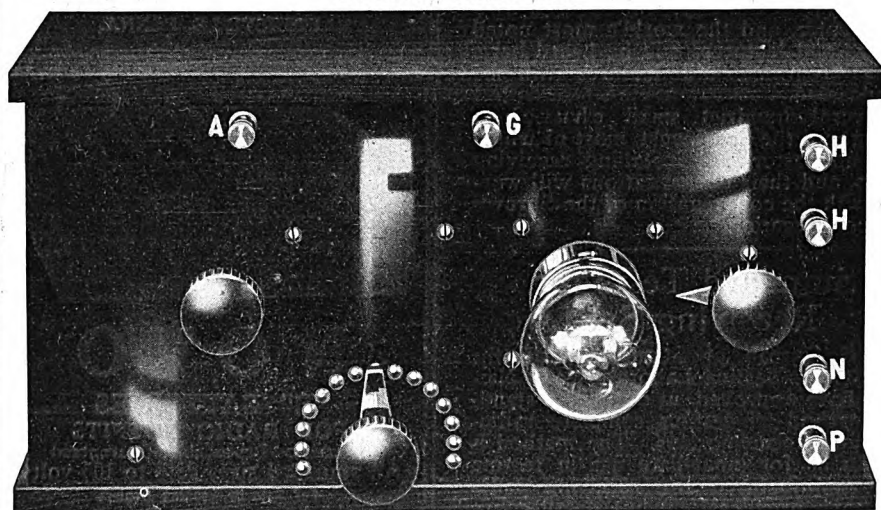
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VACUUM TUBE DETECTOR SET

"Simplicity Senior" No. 1 (without tube, phones or batteries)

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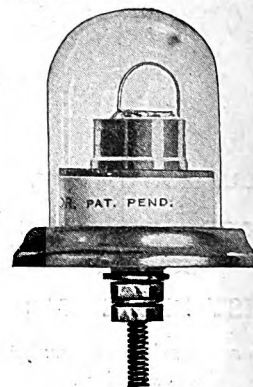
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(Actual Size)

PRICE \$2.00

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GUARANTEED ONE YEAR
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US \$2.00 AND WE WILL MAIL
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9 Central Ave. Newark, N. J.

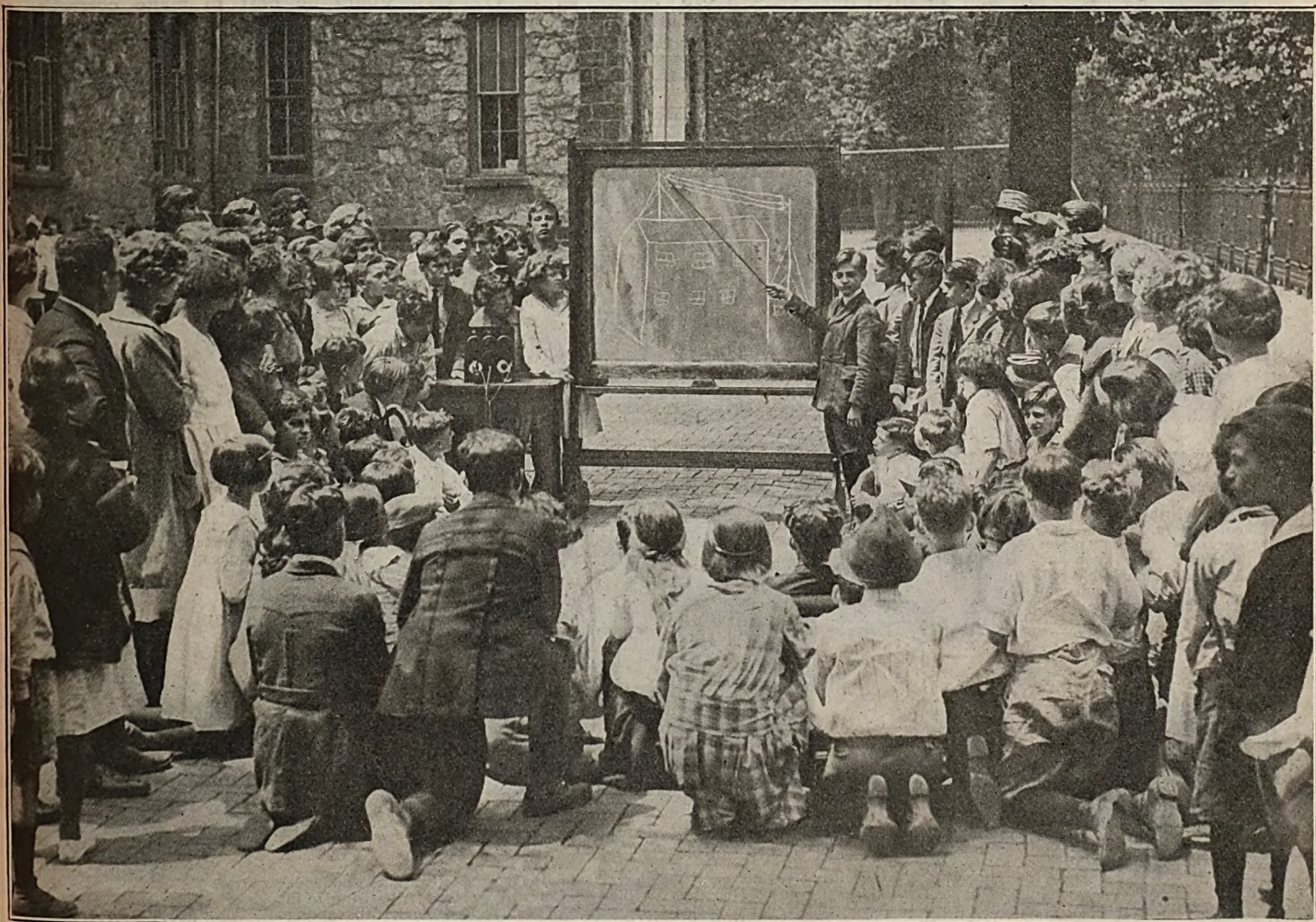
(See Page 3)

RADIO WORLD

Entered as second-class matter, March 28, 1922, at the post office at New York, New York, under the act of March 3, 1879

I L L U S T R A T E D

William N. Allen, Youngest Radio Expert and His Class



(C. P. & A. Photos.)

He is only eleven years old, lives in Philadelphia, and has held a government license for over two years. He holds the chair of professor of radio in a public school. He handles wireless messages at the rate of ninety words a minute. There he is standing by his blackboard.

Armstrong's New Super Amplifier

Fully Explained
with Diagram, Page 6

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HOMCHARGE YOUR BATTERY for A Nickel

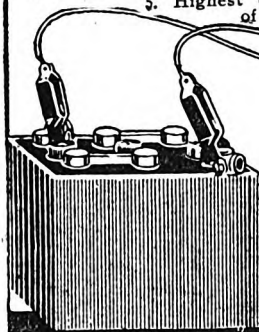
No muss, trouble, dirt—no moving of batteries—loss of time—no effort on your part—no technical or professional knowledge needed.

THE HOMCHARGER

successfully meets all charging conditions, and is the only rectifier combining the following essential Homcharging features:

1. Self-polarizing. Connect battery either way and it will always charge. No danger of reverse charging, ruined battery or burnt-out rectifier.
2. No delicate bulbs to break or burn out. Only one moving and two wearing parts. These are replaceable as a unit, after thousands of hours' use, at small cost. Cannot be injured by rough handling.
3. Operation stops and consumption of current ceases immediately upon disconnecting battery.
4. The only charger costing less than \$100.00 that will fully charge a battery over night. Gives battery a taper charge—exactly as recommended by battery manufacturers. Guaranteed not to harm your battery even though left connected indefinitely.
5. Highest efficiency of any three or six cell charger made.
6. No danger of fire. Approved by Underwriters. Immediate Delivery.

Attention Motorists. Will charge your auto battery as well as radio battery. Send for Bulletin No. 58 for further information. For sale by all radio, electrical and accessory dealers or shipped, express prepaid, for purchase price, \$18.50. \$20 West of Rockies.



The Automatic Electrical Devices Co.

135 WEST THIRD STREET CINCINNATI, OHIO
BRANCH OFFICES—New York, Chicago, Pittsburgh,
Los Angeles, New Orleans, Detroit, Toronto, Philadelphia, Baltimore, Dallas.

Another Use for Radio

RADIO has been used by the larger power and lighting companies of New York for a number of years, says "The Evening Mail Radio Review." Those who are not familiar with the work of the special receiving instrument used would have a hard time guessing what it does.

The special receiver gives storm warnings. It tells the operators of the station when heavy electrical storms are approaching so that they may have time to raise steam pressure in their boilers and prepare to supply the great flood of power that is necessary for a suddenly darkened city. Of course, the storm warning is important only in the day time when the station is not prepared to supply its full quota of power.

The special receiver used is mounted in a small box on the wall. It picks up the heavy static charges that precede the storms, and the action of these charges causes a bell to ring.

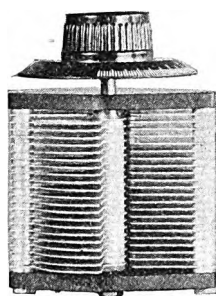
We Stand Corrected

TELEGRAM

The National City Company
Cleveland, Ohio: June 22, 1922.

Editor: Radio World, New York—
Note you misprinted or was misinformed as to code for letter "G" in your article headed: "How to Learn the Code"; should be dash, dash, dot, not dash, dash, dot, dot, as you have it. Usually first impressions are the ones that stick, so would be best to make correction as early as possible. Your magazine is F. B.* but how about some more hook-ups? 73.—A. J. Royce.

* Meaning, in radio, "Fine Business."



"METRADIO"

Variable Condenser

One of the best made condensers, rigid, accurately spaced plates. 43 plate with knob and 3" dial, complete, \$4.75
23 plate with knob and 3" dial, complete, \$3.85



"METRADIO"

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One of the best rheostats on the market with 2" dial and knob. Complete, \$1.25

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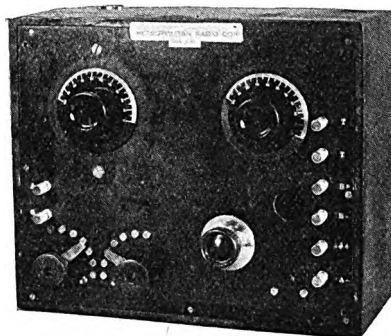
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Radio Corp.
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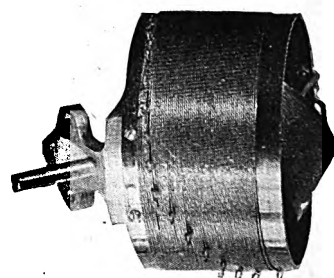


"METRADIO" One Tube Receiving Set 10"x12"x5 1/2"

Has tuning range 150 to 650 meters. Wonderful receiving power, clear tone and wide range. With this set you need not worry whether you will receive. All wiring is in the back of hard rubber panel enclosed in mahogany finished cabinet, thus giving it a very neat appearance. Without tube or head phones, \$37.50

DISTRIBUTORS AND JOBBERS:

Write for "METRADIO" complete tube machines and all parts. Territory open all over the country, apply at once. We make actual deliveries, not promises.

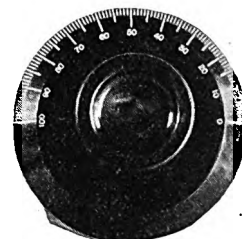


"METRADIO"

180° Vario-Coupler

Will hold range when once found. Easily installed, will operate perfectly, and give highest efficiency.

Price, \$3.75



"METRADIO"

Dial and knob complete.
3"75c.
2"60c.

RADIO WORLD

[Copyright, 1922, by Radio World Co., New York, N. Y.]

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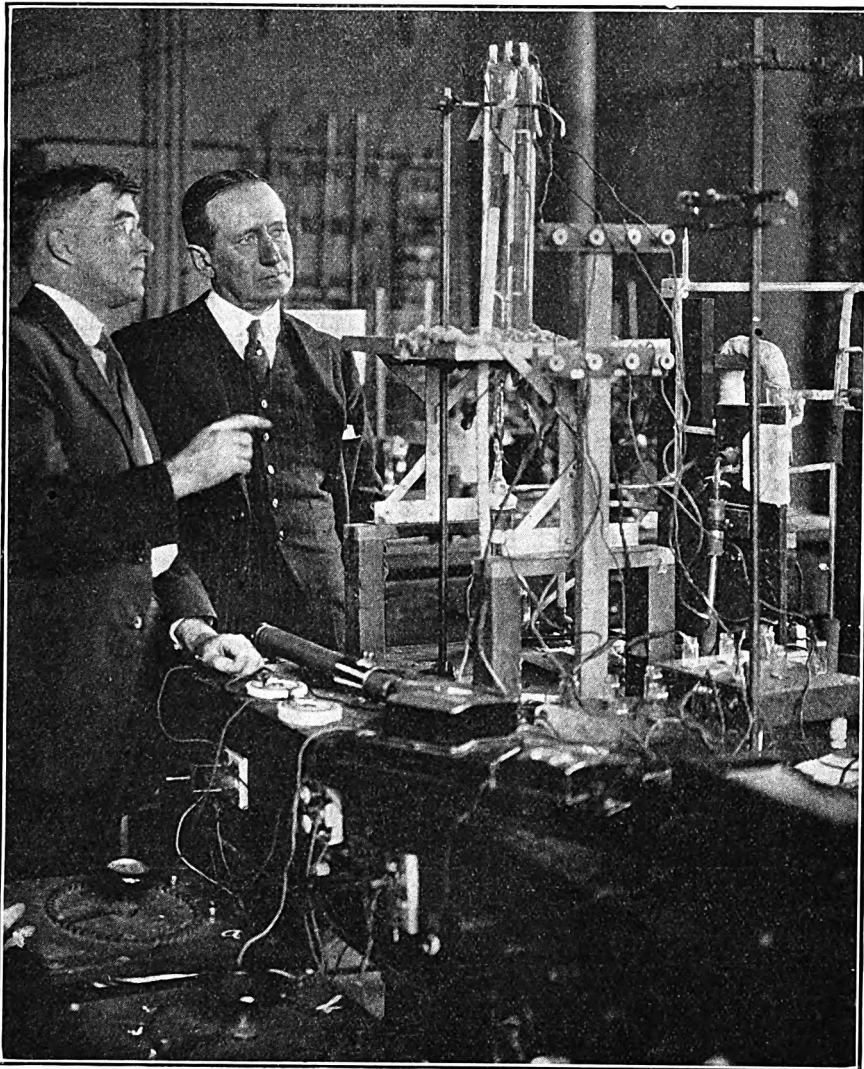
Vol. 1, No. 15

July 8, 1922

15c. per copy, \$6.00 a year

Tiny Radio Sender Will Save Space and Scrap Huge Plants

Senatore Guglielmo Marconi and Dr. Irving Langmuir (left) in Dr. Langmuir's experimental laboratory at the General Electric Plant, Schenectady, New York. Marconi is being shown the machinery that tests out the wonderful new tube, about eighteen inches long and about two inches in diameter which radio experts think will revolutionize long distance communication and cause the scrapping of millions of dollars worth of equipment in wireless stations all over the world. This small contrivance of glass and wires, or some further development of it, is expected to take the place of alterna-



(C. P. and A. Photos.)

tors of several hundred times its size, so that the long distance radio transmission plant of a short time hence may be much smaller and more compact. It will also be virtually noiseless, except for the dynamos generating the power, as the clattering apparatus which now hurls the electric wave into the ether will be gone forever. It opens up a further possibility. If power for the operation of a transatlantic wireless transmission station is wired into this tube from some distant point a set hurling messages across thousands of miles of ocean, or around the world, may be placed in a room no larger than ten feet square.

A NEW device—a tiny tube compared with some of the massive apparatus used in connection with radio—is being developed in the research laboratory of the General Electric Company, by Dr. Irving Langmuir, who predicted that the next revolutionary step in radio would be a tube of this kind.

By this apparatus direct current flows into the tube through a complicated wire system, and high-frequency current is generated which flashes signals through the ether in electric waves that travel with the speed of light to distant stations.

The tube is an advancement over the Anderson alternator just as that was an advancement over the old Goldsmith alternator—which was designed in Germany—and over the first spark sets de-

signed by Marconi for cross-ocean radio transmission.

Dr. Langmuir's tube is 50 kilowatts and develops 12 horsepower within its narrow walls of glass. He has been working on the tube for several months.

It is predicted that it will take the place of the massive alternators of the Anderson type. What Mr. Marconi saw when the photographer made the accompanying illustration was this:

One of the new high-frequency generator tubes has been connected with an apparatus carrying 15,000 volts in direct current. A small blue flame shot through the tube without creating any noise, but releasing the electrical impulse that may be hurled thousands of miles. This darting blue flame in walls of clear glass

takes the place of the immense alternator now in all wireless plants and the long metal arms which now create the electrical wave with great noise and sparking. The broken impulse from the great electrical generators behind the tube is shot along to the antenna noiselessly in the dots and dashes of the international code through a space not much larger than a stick of dynamite, but infinitely more powerful.

E. J. Nally, President of the Radio Corporation of America, which, with five wireless circuits operating across the Atlantic and one across the Pacific, is the largest commercial radio business in the world, said that the tube would scrap every big plant in existence when it is fully developed.

Radio's Place in the Phenomena of Nature

By E. L. Bragdon

THE recent statement by William Marconi that he had intercepted ether waves having the extraordinary length of 150,000 meters, coupled with the fact that the superregenerative hook-up of Major Armstrong will permit the amplification of signals of 100 meters or less, brings up this interesting question: "What is the top limit of wave production, and what constitutes the bottom limit?" The answer is the exact status of radio in the phenomena of nature.

If a triangular shaped piece of glass is held in the path of a sunbeam, a rainbow of color will be thrown on the wall or screen beyond the glass prism. The white light of the sun has been broken up into the primary colors. Scientists show that this break-up is due to the difference in the wave lengths of the various colors which, combining, produce a white light.

The real difference in the wave length is small when figured in inches; but the amount, if great enough, will cause complete diffusion. Beginning with the violet, which is seen at one extreme end of the spectrum and continuing down through to the deepest red, the waves vary in length from .000018 inches to .00003 inches.

Just what lies between the wave of .00003 inches and the shortest radio wave has not been settled to the satisfaction of all physicists. A radio wave of 100 meters has a length of 393 feet. The tremendous wave of Marconi, which the great radio-engineer indicated as a signal from Mars was nearly a hundred miles in length.

It is said that the United States government bureaus and the research laboratories of leading manufacturers have successfully transmitted and received radio waves of less than 50-meter length. But when one stops to consider that the frequency of the wave with which the engineers are working at 50 meters is 6,000,000 a second, the difficulties are readily appreciated. The shortest Herzian wave on record was produced experimentally and was about 150th of a meter in length. If apparatus can be perfected by which amateurs may utilize the band of waves between the present 200-meters limit and the microscopically small wave just mentioned, there will be no further need for legislation to prevent interference.

A discussion of the subject of wave motion brings out the fact that there are other waves than radio waves that

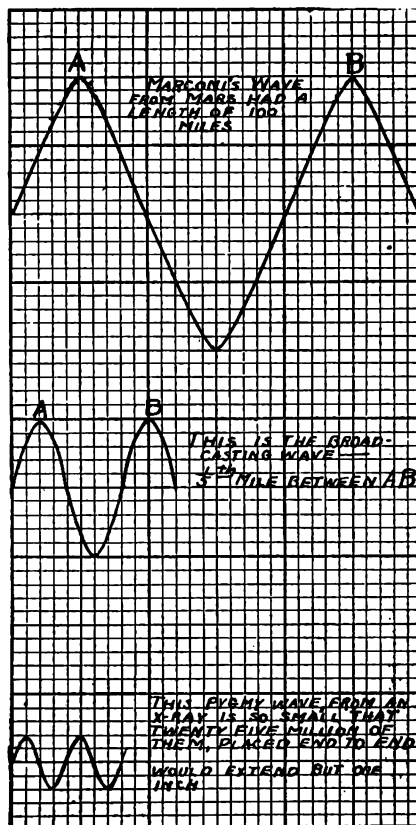


Diagram illustrating the difference in wave lengths. The difference between the largest and smallest wave is so great that it cannot be drawn to the same scale and be recognizable. Drawn by E. L. Bragdon.

are shorter and longer than the waves we are using to transmit intelligence by air. The waves of light which produce various colors, as described, are separated from radio waves by the infrared or heat waves, and still further down the scale toward the minute waves are the X-rays with their lengths around .000000004 inch.

As waves go, the longer radio waves do not have so many competitors. Perhaps the best example of the extremely long waves are those of our common alternating current. A 60-cycle alternating wave — the type constantly passing through the incandescent lamp — has a length of 5,000,000 meters. If this last figure is considered in connection with the 360-meter wave used for broadcasting, it is not so difficult to understand how broadcasting can be carried out over the ordinary light wires. The two waves are so far separated in magnitude that there would be little danger of their ever becoming tangled and twisted.

Over 20,000 Now Send Radio

TOTAL transmitting stations licensed by the Radio Section of the Department of Commerce now number 20,265. Of this number, 3,572 are ship and commercial land stations; eleven transoceanic; 558 special land stations, including experimental and technical stations; 348 broadcasting stations and 15,776 amateur stations.

The amateurs licensed to transmit messages, are grouped as follows in the 9 districts:

- 1—Headquarters, Boston. Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut.—2490.
- 2—Headquarters, New York City. New York (County of New York, Staten Island, Long Island, and counties on the Hudson River to and including Schenectady, Albany, and Rensselaer,) and New Jersey (Counties of Bergen, Passaic, Essex, Union, Middlesex, Monmouth, Hudson, and Ocean).—2336.
- 3—Headquarters, Baltimore. New Jersey (all counties not included in second district), Pennsylvania (counties of Philadelphia, Delaware, all counties south of the Blue Mountains, and Franklin County), Delaware, Maryland, Virginia, District of Columbia.—1863.
- 4—Headquarters, Savannah, Georgia. (Baltimore, Md.) North Carolina, South Carolina, Georgia, Florida, Porto Rico.—342.
- 5—Headquarters, New Orleans, Louisiana. Alabama, Mississippi, Louisiana, Texas, Tennessee, Arkansas, Oklahoma, New Mexico.—740.
- 6—Headquarters, San Francisco, California. California, Hawaii, Nevada, Utah, Arizona.—1676.
- 7—Headquarters, Seattle, Washington. Oregon, Washington, Alaska, Idaho, Montana, Wyoming.—732.
- 8—Headquarters, Detroit. New York (all counties not included in second district), Pennsylvania (all counties not included in third district), West Virginia, Ohio, Michigan (lower peninsula).—2567.
- 9—Headquarters, Chicago. Indiana, Illinois, Wisconsin, Michigan (upper peninsula), Minnesota, Kentucky, Missouri, Kansas, Colorado, Iowa, Nebraska, South Dakota, North Dakota.—1030.

Broadcasting stations, to-day, total 348, representing all but six States. This number is over five times the total broadcasters listed by the Department of Commerce three months ago. Yet some people ask if radio is going to last?

The Function of the Loose Coupler

By Charles H. Plath

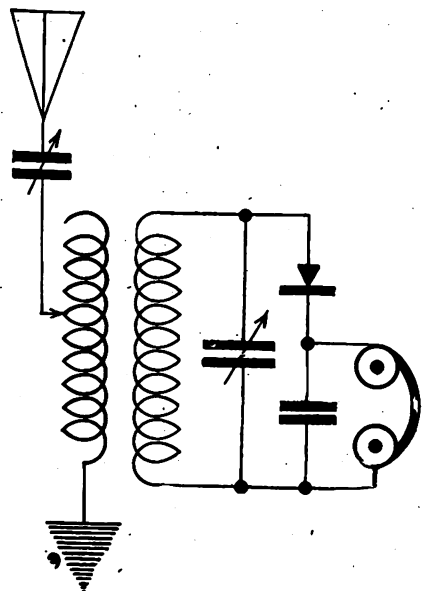
THE loose coupler is one of the essential elements that make a receiving set possible. It consists of two coils of wire, wound on fiber or cardboard cylinders, one of which is movable and the other stationary. The stationary coil is generally made up on a three- or four-inch cardboard tubing. This tubing should be properly shellaced and left to dry. This makes the tube hard so that no sagging or warping will occur. After it has become dry, it is then wound with an even layer of No. 24 single cotton-covered copper wire in such a manner that the windings are alongside of each other, close and tight. Usually sufficient wire is used to depend upon the wave length desired. For short reception, 80 turns are generally used. This stationary coil is called the primary coil. The next coil, which is movable, is called the secondary. The tube is smaller in

method used to transfer the energy from one circuit to another is known as coupling.

Both coils are either equipped with taps or sliders that enable the operator to vary the number of turns in use on either of the coils. By turning the knob over the taps, and manipulating the secondary inside of the primary, a point will be attained where the signals come in the strongest. In case of interference, this coupling, as I have explained, will have to be altered again, in order that interference may be eliminated. One thing must be borne in mind: if the coupling should happen to be jammed in and signals should be the loudest, at that point, don't imagine that the set is working its best, because it is not. With this tight coupling, the receiver will pick up all sorts of other signals from other stations and, also, interference. In case this interference takes place, the coupling will have to be altered—that is, varied. This is done by pulling out the secondary from the primary until this interference is eliminated; but you

will discover that a decrease in signals will occur when attempting to tune out interference.

There is a type of detector that is best for use with this machine. Of course, the crystal still remains the favorite among some fans for short-wave reception. Many amateurs are using the crystal detectors with an inefficient hook-up. The sketch shows a correct wiring-diagram for connecting up the receiver. An aerial for this set should be, at least, 100 feet long and in one stretch. The lead-in should connect at one end, forming an inverted L. The end that takes in the connection from the lead-in will be the direction of the greatest receiving-strength from that direction; therefore, erect and connect your aerial in the direction of the broadcasting station you wish to hear. Keep the aerial free and clear from all metallic structures. Also, be sure to get a good, perfect ground. If a water pipe is used as a ground, be certain to scrape and clean off the pipe good before soldering on your ground wire.

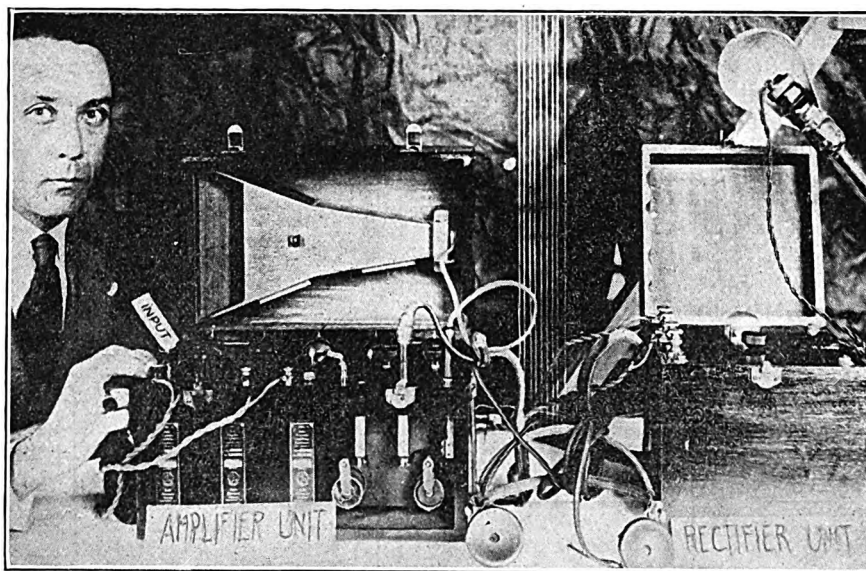


Schematic diagram of a crystal receiver, showing the loose coupler in a circuit. This method of coupling is termed inductive coupling. It has many advantages over the conductive or single circuit receiver. Suggested by Charles H. Plath. Drawn by S. Newman.

diameter, so that it can be placed on a shaft in order that it can slide in and out of the primary.

This tube is made in the same manner as the coil with the exception that No. 30 wire is used. When completed, it is called a loose coupler. The coils are now primary and secondary, but the secondary sliding in and out of the primary. Its purpose is to transfer the electro magnetic induction from one circuit to another, whereas the

New Amplifier Eliminates Battery



(C. Underwood & Underwood, N. Y.)

P. D. Powell, of the Bureau of Standards, Department of Commerce, has evolved a radio receiving-set in which the usual batteries are eliminated and connection made, instead, to an ordinary electric-lamp socket. This has been a long-sought invention. With it, care in operation is no longer to be met. The illustration shows Mr. Powell with his new apparatus in which he employs radio and audio frequency units. The amplifier unit consists of radio frequency, while the rectifying unit consists of audio frequency. Using this type apparatus, any antenna may be used; but a loop aerial has preference, due to the fact that radio frequency is being employed. Mr. Powell, recognizing the drawbacks in the storage battery to the general use of radio sets, developed this new radio-amplifier in which the filament and plate batteries are eliminated. Just think of placing a plug in the lamp socket and, after lighting the tubes, listen in without weakening the storage battery.

Armstrong's Superregenerative Amplifier Fully Explained

By John Kent

OWING to the unusual interest in the new superregenerative amplifier, the remarkable radio invention of Major Edwin H. Armstrong—an interest that is attested by the scores of letters RADIO WORLD has received since the publication of its first article on the subject in its issue No. 13, dated June 24—we present here a full and simple explanation of the manner in which the Armstrong device works. Any amateur who follows the explanation and schematic diagram here given should be able to get full results.—The Editors.

MAJOR ARMSTRONG'S invention is a very important step in the development of radio. Better known as the "superregenerative receiver," his system answers some of the much-mooted discussions and complex problems in radiotelephony.

It eliminates the reception of spark signals entirely, while listening to the radio concerts. Its amplification is enormous—amplifying a set 100,000 times its signal strength.

In RADIO WORLD, No. 13, dated June 24, the diagram of this circuit was published. We print it again, with the various values requested, so that any amateur may make up this set at a reasonable cost.

K-1 and K-2 are variable condensers, having a capacity of .001 mfd. each. L-1 and L-2 are honeycomb coils which form part of the low-frequency super-audible circuit, and which will not vary with the changes in the regenerative set. Coils L-1 and L-2 are shown, being D L 1500 and D L 1250, respectively.

These coils have been found to have a suitable range for broadcasting stations with a range of 360 meters. The condensers have the advantage of controlling the frequencies of the two circuits.

K-1 is the wave-length control.

C battery is connected in series with the grid and has a voltage of from 4 to 12 volts.

The tubes used are U. V. 201 for the detector and U. V. 202 for the second tube, although the oxide filament tubes of the Western Electric Company give better results.

This type set is best adapted for the loop aerial having the marked advantage of reducing static interference. Although the outside antenna may be used to play a commanding feature in balancing interference.

This is accomplished by tuning in the desired signal on the loop aerial and then tuning out the undesired signal on the outside aerial. This is the result of varying the coupling at L until the undesired signal is balanced

out. It is recommended that the tubes mentioned above be used, as the plates must stand high-plate potential. In the drawing 90 volts is shown. Note all the polarities in the drawing. They are very important.

13 More to Broadcast

THE Department of Commerce issued 13 more broadcasting licenses during the past week, including one to a radio school in Porto Rico and one to a radio shop in Charleston, South Carolina. These are the first stations in Porto Rico and South Carolina. This leaves but five states without one or more broadcasting stations.

The thirteen new stations licensed, bring the total list of broadcasters in the United States and territories to 361.

Call Station
WFAY—Daniels Radio Supply Co., Independence, Kan.

KFAC—Glendale Daily Press, Glendale, Cal.

WFAX—Arthur L. Kent, Binghamton, N. Y.

WFAU—Edwin C. Lewis, Inc., Boston, Mass.

WFAW—Miami Daily Metropolis, Miami, Florida.

WFAZ—South Carolina Radio Shop, Charleston, S. C.

WFAV—University of Nebraska, Lincoln, Neb.

WGAF—Goller Radio Service, Tulsa, Okla.

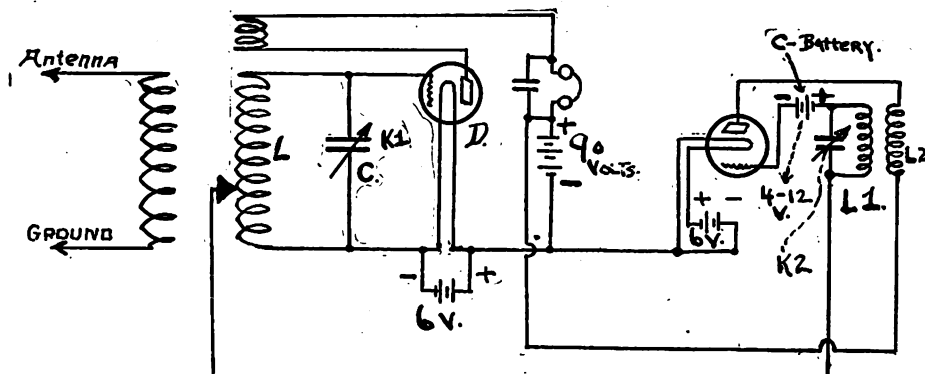
WAAB—Valdemar Jensen, New Orleans, La.

KFAD—McArthur Bros., Mercantile Co., Phoenix, Ariz.

WGAC—Orpheum Radio Stores Co., Brooklyn, N. Y.

WGAD—Spanish American School of Radio Telegraphy, Ensonada, P. R.

KFAE—State College of Washington, Pullman, Washington.



"A brief way to describe the superregenerative circuit," says Major Armstrong in "Radio World," dated June 24, "is that one vacuum tube is made to do the work formerly done by three. It has been shown for several years that the limit of amplification is reached when the negative charge in the tube approaches the positive. In experimenting I found that it is possible to increase the negative charge temporarily, for about one twenty-thousandths of a second, far above the positive, and still keep the average down. It is the possibility of increase which permits the enormous amplification which I have demonstrated and enables me to eliminate two tubes from the circuit. Another practical result of this circuit will be the ability to detect wave-lengths under two hundred meters with ordinary amateur-sets."

The Dual Detector Is an Asset

THE dual detector, though not generally in use, is an asset to any set that employs a crystal for detection in that should one crystal fail, and they often do, in the middle of a program, a quick shift of the switch, brings the other into play.

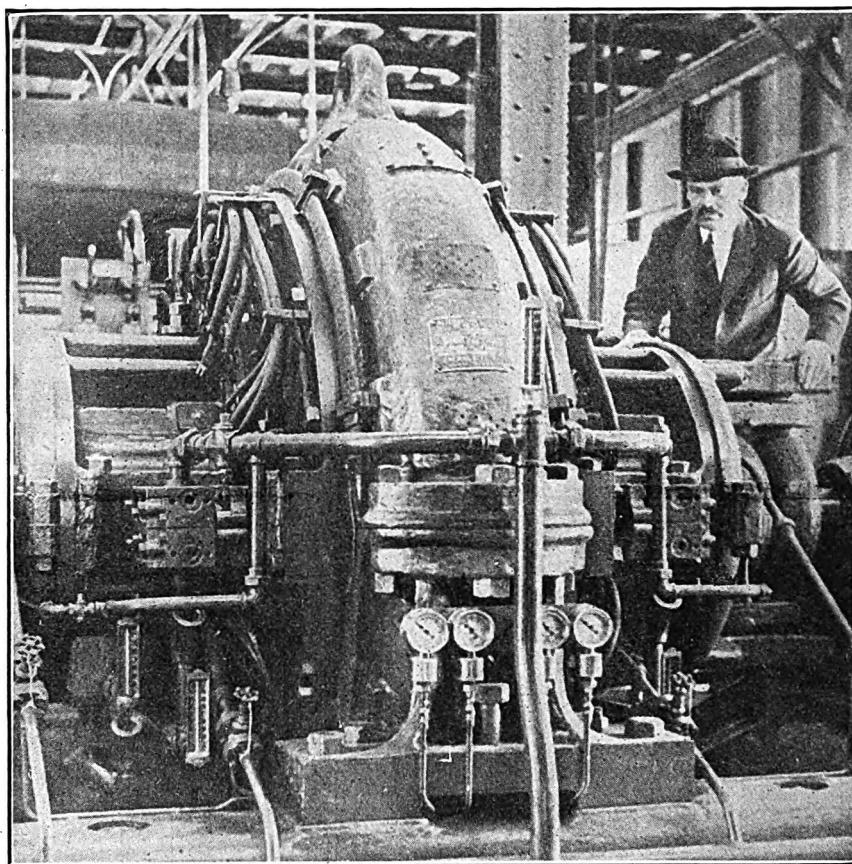
The base for the crystals is a single pole double throw switch. The two contacts are spread slightly so that they will be large enough to receive the crystals. In the experimental set upon which this article is based silicon was used in one contact and galena in the other.

On each edge of the blade a cat's whisker is soldered, the cat's whisker being a piece of brass wire about 24 gauge with filed points. The point of the cat's whisker, touched to the crystal at a sensitive spot, detects that which is to be received.

Connections are then made from either contact to the center of the switch.

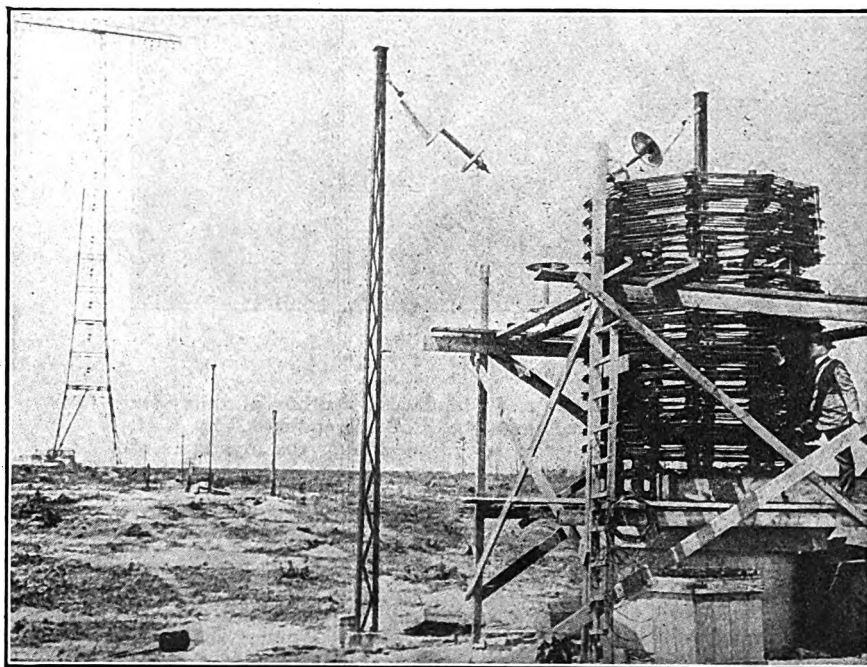
Operating a Transatlantic Station

By Fred. Chas. Ehlert



(C. Underwood & Underwood, N. Y.)

Massive high-frequency alternator in one of the large stations at Rocky Point, Long Island. The photograph shows E. F. W. Alexanderson watching the operation of his own invention. This is the machine that makes transoceanic wireless possible. It is not used by other large transoceanic stations. These machines are specially built by the General Electric Company, Schenectady, New York



(C. Underwood & Underwood, N. Y.)

Large multiple tuning-coil, the invention of E. F. W. Alexanderson, is plainly shown in the above photograph. This tuning-coil is at the central station, Rocky Point, Long Island. The large towers show what the transmitting aeri-als are like, also their immense length and height

THE leading nations of the world have fully realized the value of radio as the best means of long distance communication. The world war indicated that cables and telegraph lines can be destroyed, but the radio can not be interrupted. The nation with powerful radio stations is always assured of communication with the outside world. If one realizes that, only a few years ago, when a steamship left a certain port, it was completely cut off from the world. Today, a ship on the high seas is in the same position as a first-class hotel so far as communication is concerned. Radio Central is the name given to the high-power, wireless installation erected by the Radio Corporation of America. The station is situated near Port Jefferson, Long Island, New York, about seventy miles from the heart of New York City. The station was designed to supplement the existing communication facilities from the United States, and to provide direct radio-service with Great Britain, France, Norway and other European countries, as well as South America. This important station occupies some 640 acres. The station, eventually will consist of a number of separate antenna systems, each provided with the necessary transmitting plant for simultaneous radio communication over a number of different routes. The large receiving antenna at Rocky Point, is shown in one of the accompanying photographs.

Some doubt may have been entertained by engineers as to the traffic-carrying capacity of the ether, for long-distance communication. The figures for long-distance telegraphy may be estimated. Let us assume continuous wave transmission, with an appropriate form of key modulation in sending the dots and dashes,—and without any tone modulation whatever. Under these conditions, and taking into account both side bands produced as the result of actual transmission, it has been determined that a speed of 100 words a minute corresponds to the occupation of a band of frequencies in the ether, roughly, 100 cycles wide.

This is on the basis that the radio-frequency generator maintains its frequency constant during transmission. An illustration herewith shows this high frequency generator, or alternator, designed by E. F. W. Alexanderson and built by the General Electric Company. Mr. Alexanderson is seen alongside his own invention, which made transoceanic wireless possible. This machine is automatically controlled by a central control-operator by

(Continued from preceding page)

which the dots and dashes are sent to the antenna for transmission. Each antenna is of the Alexanderson multiple tuned-type. It is provided with several earth connections along its length, each connection including a tuning coil. As may be seen from the photograph these coils are set up in the open air.

The final installation will include ten Alexanderson alternators, which, when operating, will give a total output of 2000 K. W.

Grid Leaks

Tiny - Tube Paragraphic
Comment on Regenerative
Radio Topics of
the Week

By Thomas Marion

BIG things in radio happened during the past two weeks. One of them was Major E. H. Armstrong's demonstration of his super-regenerative receiver. But it is only one of the steps toward bigger things to follow. Radio is making the world look like a golf ball.

* * *

I have received many letters from readers anxiously inquiring if they should discard their present apparatus in view of the major's invention. Emphatically, NO! It is a revolutionary invention, to be sure; but time must be taken for standardization, manufacturing, and merchandising.

* * *

When such matters puzzle you, remember that it is best to reflect.

* * *

Other readers want to know if the Armstrong system and apparatus will be made public. The editors of RADIO WORLD assure me that they will publish all such matter as fast as circumstances permit.

* * *

Another big thing was Marconi's demonstration of flashing radio waves to a chosen point—just as sun rays are flashed back by a mirror. Easy enough! Since old Chris Columbus stood his egg on end, many of his descendants have performed more wonderful stunts.

* * *

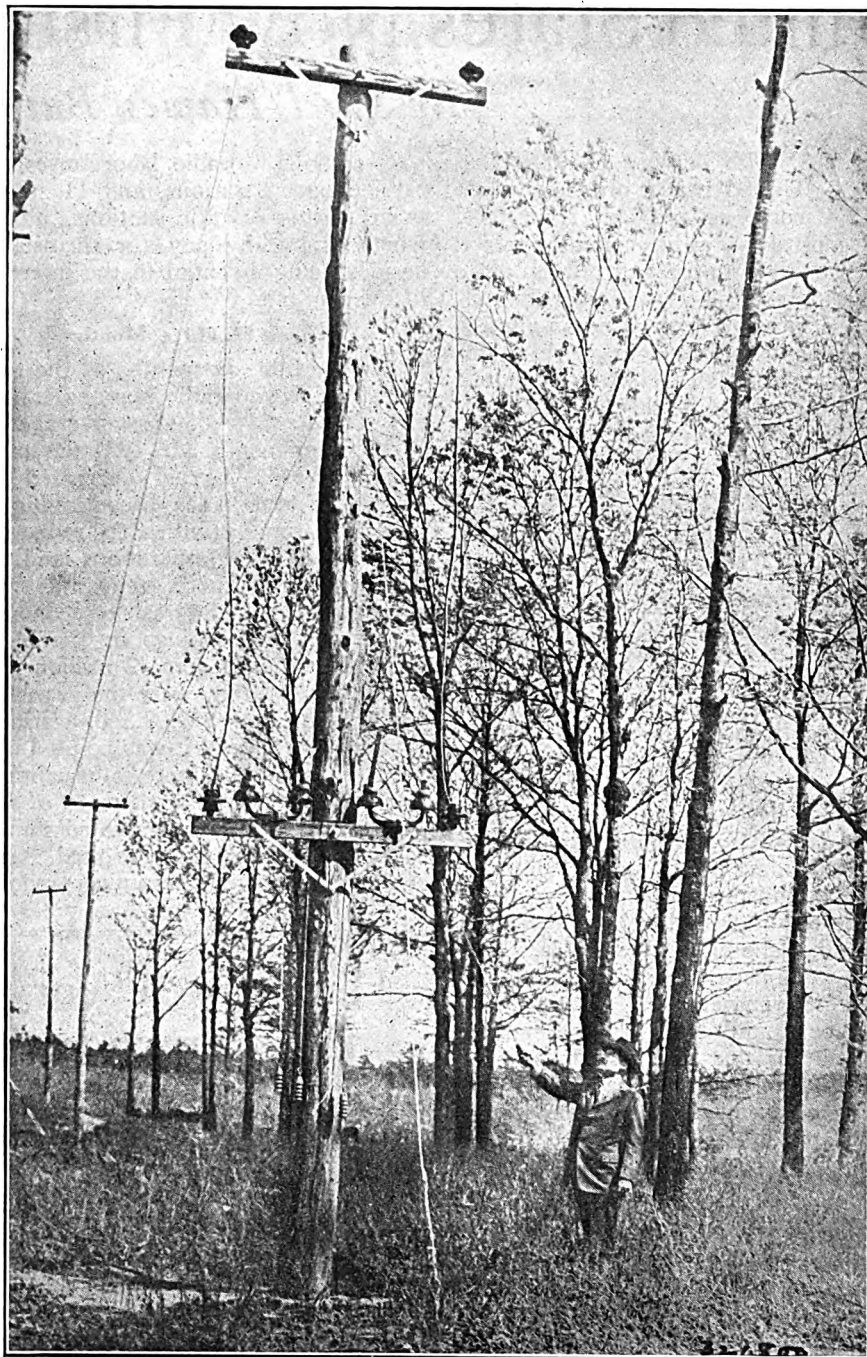
I hear that the old-timers' dinner is to be a fact this fall. Some of the pioneers were willing to make it a summer event; but we all know what it means to doll up in a suit with a southern exposure and a collar like the rear wall of a battery cabinet, when the temperature is trying to ooze out of the thermometer.

* * *

George W. May tells us, in RADIO WORLD, No. 14, that the crystal detector is limited to about twenty miles range. I have often wondered what might be the range limit of my colleague, Miss Crystal D. Tector, who keeps us posted on what women are doing to radio. She seems to be a vacuum-tube detector of some voltage.

* * *

Herbert R. Hoover is to be the czar of American radio. His job will not be a sinecure. No doubt he will be needed to



(C. Underwood & Underwood, N. Y.)

The above illustration shows E. F. W. Alexanderson, chief engineer of the Radio Corporation of America, throwing the ground switch on the receiving antenna at the Riverhead Station, New York, which receives all radio messages from Europe. The aerial is only thirty feet high, but it is nine miles long. The height is not essential as the aerial would work just as well on the ground and is elevated only as a matter of protection. Nine miles is the approximate length of the radio waves from European stations.

Keep us all in order; for we are fast beginning to crowd one another in our enthusiasm.

* * *

And, in the face of this, they tell me, radio has not even scratched the surface of the country—meaning by that, it has yet to be adopted by millions. Outside the larger cities, it has many fields to conquer. A good sign—taking into account the vast business in radio equipment that is being handled.

* * *

I was tuned in when Dr. Copeland, New York City's health commissioner, gave some pointed chatter on keeping your body clean as well as your mind. The

advice was good but what pleased me most was the doctor's fine clear radio voice. They say that a "movie" actor "screens well." Let me say that Doc Copeland "radios well."

* * *

"The spirit world may be reached by wireless." Right here we have a hunch. Let Washington put Conan Doyle, Hereward Carrington, and Thomas Edison in charge of the prohibition enforcement, so as to locate the spirits of the bootleggers. Whether all the spirits would tune in or not we can't say.

* * *

Watch for big news in radio! Things are moving fast.

United States Now First in Radio Work

By Carl Hawes Butman

WASHINGTON, D. C.—The United States practically has complete freedom from foreign control of radio communication between this country and others, and, furthermore, American commercial and naval services are exercising an almost predominant influence in world-radio communication. This was the statement of Rear-Admiral J. K. Robison, chief of the Bureau of Engineering of the United States Navy, in a recent interview with a RADIO WORLD representative.

"This has been brought about to no small extent by the cooperation and assistance of the Navy Department," he declared, pointing out that, ever since 1902, the Navy has used radio as a medium of rapid communication; and that, since 1904, when President Roosevelt put all shore radio stations except land military stations under its direction the Navy had controlled all Governmental stations.

The Naval Communications Service has been developed rapidly, but as many stations as possible have been transferred or closed, including twenty-three since the close of the war. The naval stations on the Great Lakes would be transferred if someone else could be found to operate them, he said, stating that these stations were all institutions for the saving of life and property on the Lakes and could not be abandoned.

Navy Asks \$3,828,460 for Radio

"I have estimated the cost of maintaining the Navy's 214 coastal stations for the fiscal year 1923 at \$2,822,360, over \$100,000 less than was appropriated last year," said Admiral Robison, "and have asked Congress for that amount, as well as \$1,006,100 for new radio and sound equipment and its maintenance on board ships." He continued: "It now looks as if the Congress would cut the total sum by about one million, necessitating great economies in our program."

"The operation of the shore stations pays a dividend into the Treasury of over 100 per cent than the amount of its expenses, every year," he stated. Going further into details, the head of the Navy's radio research and maintenance department explained that the shore stations did not interfere with other government or commercial services, and that they were necessary to the safety of merchant and war ships, both in times of peace and war.

To-day the Navy has 214 shore communication stations, including 90 on the coasts, 46 on lightvessels, 54 radio com-

pass stations, 3 radio laboratories, 10 carrier-pigeon stations, and 11 super-power trans-Atlantic stations, all of which practically pay for themselves besides being essential in the interests of the country.

Earns \$23,000 a Month

For the first six months of the current year, Naval radio stations earned the sum of \$144,659, an average of \$23,000 per month. In 1921 the number of words carried decreased by 24,946,657, due to the discontinuing of many war-time activities, the reduction of Shipping Board operations, and the elimination of much telegraph and radio traffic in the interests of economy. Therefore, the earnings or "savings" decreased in 1921 some 2 million dollars over what they were the year previous, being only \$3,509,386, a sizable saving nevertheless, it was pointed out.

"It is worthy of note," the admiral interjected, "that the interests of the United States Navy in radio communication has resulted in the United States commercial interests becoming predom-

inant in world radio communication."

The Navy's net is almost world-wide, and connects all the Government's outlying possessions with the United States, furnishing as well a medium of rapid communication with our fleets of war and merchant marine.

Replying to a question as to what the Navy had done specifically to develop the art of radiotelegraphy and telephony, Admiral Robison stated that a few of them included improvements in facilities for secret communication; increased the range of aircraft radio sets from 50 to 500 miles, and reduced the weight materially, making long-range spotting possible; developed a pilot cable for harbors and aircraft landing fields, increasing the safety of both water and aerial navigation; made possible the sending and receipt of five simultaneous messages; increased long-distance speed from 10 to 60 words per minute; and made possible automatic transmission and reception. Other work includes the development of the kite aerial for transmitting from a seaplane on the water; radio compass improvements making radio applicable as a direction indicator and position finder; the elimination of static and "mush"; an advance in the radio controlled torpedo and vessels; and the introduction of the arc transmitter and uniwave system of signalling.

Navy Radio Developments

Under ship-radio equipment, Admiral Robison said: "There remains to be accomplished for the next fiscal year the installation of new equipment on vessels in active service on which there has been no opportunity to do work. The use of vacuum-tube transmitters is becoming general, and this requires the conversion of the present Navy spark-sets now installed on all ships. This applies especially to submarines. By using a tube set the radio range of submarines will be increased about five times, or from 75 to 400 miles. Submarines are being equipped with aeriels and receivers of such type that receiving under water will be practicable and transmitting without coming fully to the surface will be possible.

"One effort in the past two years has been to develop and test a standard type of listening device equipment for each type of naval vessels for detecting the presence of submarines, which proved most necessary during the World War. The bureau is now ready to install this apparatus, which is of a confidential nature, on several destroyers and a few battleships," he concluded.

He Turns Theory Into Practice



(C. Kadel & Herbert News Photos.)

A "close-up" of Senatore Guglielmo Marconi, master of radio, now visiting America, whose keen mind is ever planning the practical things to which this new science—which means more, perhaps, to mankind than any other science—may be put. This photograph was taken while Senatore Marconi was inspecting the radio equipment of the Atlantic liner "America."

Radio and the Woman

By Crystal D. Tector

THEY tell me—and by they, I mean the women I meet at the various afternoon places where the up-to-snuff ones congregate for their daily chatter—that if the Congress of the United States made Herbert Hoover the “big noise” in the radio workings of the country, he is to give women a chance whenever he has any offices to fill. This is not only fair, but in the best interests of the new science. Mr. Hoover has been given to understand that we—whom man has been pleased to call “the gentler sex,” are moving into the front ranks of the people who are “doing things.” Woman is to have her chance in the field of radio as a worker.

* * *

Take Mrs. Marconi, as an instance. I am glad to be able to present so good a likeness of her as that accompanying my department of RADIO WORLD. A smart, intelligent woman who accompanies her husband on all his tours of investigation and is of the greatest help to him in his laboratory work. If you could have seen her as she walked beside him on his tour of inspection of the Radio Corporation of America's big plant at New Brunswick, New Jersey, the other day! Certainly she did not impress one as a disinterested female who tugged along simply because it was her husband's business and she felt that she must do her duty. No! Mrs. Marconi took an individual interest in everything. And it is surprising what she knows about radio. I'll wager that a radio talk by her would be worth listening to.

* * *

And a little bird also whispers that Mrs. Harding is another untiring radio fan—that she is, to a large extent, responsible for the report that the White House is to be equipped with one of the best radio sets purchasable. One can't blame Mrs. Harding; for a recent visit to the wonderful city of Washington convinced me that most everyone there is quite alive to the importance of being acquainted with radio—and to a greater extent than being a mere listener-in—if one really wants to be in vogue. Most people you meet there buzz about radio. As one Senator's wife said to me: “I spoke to Mrs. B. the other day about my set and mentioned ‘static interference.’ Well, Mrs. B. looked at me as if I had committed a crime. ‘Why, don't you know that *static is interference*,’ she remarked, stunned, with an emphasis on the last three words that only a woman can employ. I just crept into my shell. I must have looked just as foolish as a two-step amplifier without a grid leak.”

* * *

The other night, at Forty-second Street and Broadway, New York, a marvelous soprano voice was coming from somewhere, and the melody of “My Old Kentucky Home” filled the early summer twilight with heart-touching wizardry. I looked up at a window



(C. Underwood & Underwood, N. Y.)

Dr. Hereward Carrington who, since the death of Professor Hyslop, is considered the leader in psychical research, has begun the interesting attempt to discover the mechanical end of mental telepathy. To conduct his experiments, Dr. Carrington uses radio. He has adapted the radiophone to detect the dynamic action of thought waves. Superinduced by a high-tension coil, the thought waves are caught by a radio detector and transmitted to the phones. The subject's head is placed in a “directional aerial.” Dr. Carrington finds women make the best subjects in his new work.

and read the word: “RADIO.” Then I knew. The most marvelous—most wonderful part of it was that this beautiful voice should come from the ether so loudly and yet so sweetly. Though it could be heard at quite some distance, the most delicate of the phrasing was as distinct as if the singer had confined her efforts to a specially acousticoned hall. I wonder who the singer was.

* * *

Let me quote from a few of the letters I have received from women readers, since the last RADIO WORLD went to press:

From Mrs. K., Pawtucket, R. I.—“My two sons picked up a ship at sea the other night. I wish you might have seen the joy on their faces. ‘Mother! mother!’ they called. I ran out and adjusted the head set. I heard a voice say: ‘We will arrive Sunday night.’ I am not exaggerating when I say that it gave me the thrill of my life.”

From Minnie B., Oklahoma City, Okla.—“Radio is fast becoming a part of our daily lives. At first we all thought that it was only a passing fad; but those who put in sets soon had us all going. Don't be surprised if I write you that we women have organized a radio workers' club.”

Miss L., Rome, N. Y.—“I have just purchased from my brother his regenerative set. He didn't tire of it; he was obliged to go to New York to take a position. I am not thoroughly able to run it; but I intend to read RADIO WORLD and learn.”

Mrs. H. B. M., Roanoke, Va.—“Why don't you publish the photograph of a woman in your Hall of Fame?” To which I reply: The editors of RADIO WORLD feel that the day will come when women will be eligible to radio's Hall of Fame; but in radio, as in all things, the Argonauts have been men.



(C. Underwood & Underwood, N. Y.)

Signora Marconi, wife of the famous radio wizard, receiving a photograph by radio at the oscillograph at the New Brunswick, New Jersey, station of the Radio Corporation of America.

How Daily Programs Are Broadcast from KDKA

By Peter Kerr

THERE are thousands of radio fans with well-equipped receiving sets who would like to know just how the daily programs are sent forth from a big broadcasting station. KDKA, the Westinghouse station at Pittsburgh, which has been broadcasting since 1920, is presumed to be one of the most thorough stations in the world. The path of a speaker's voice from its studio to your receiving set is an interesting journey. When everything is set and ready, the engineer in charge of the station tests all filament and plate batteries before each program. He then starts the transmitting set and checks the wave length by means of a wave meter. He then lights the signal light in the studio notifying the announcer that the transmitter is in operation. The announcer turns on the studio amplifier which lights the signal light in the operating room notifying the engineer that the audio circuits are in operation. He then watches the modulation meter and adjusts the amplification of the speech amplifier to give the desired amount of modulation. A loud speaker in the operating room serves as a check on the quality of the transmission.

Figure No. 1, shows in diagrammatical form the path of the speaker's voice from

the studio to the receiving station. A voice picked up by the transmitter in the studio, theater or church is amplified and transmitted by means of a telephone line to the radio station where it is further amplified and used to control the output of the radio transmitter. The radio transmitting set is supplied with power directly from the work's power plant, through a step down transformer for the vacuum-tube filaments and through a special motor-generator set which changes the 220 volts D. C. to 2,000 volts D. C. for the tube plates. The radio transmitter changes this power from 2,000 volts D. C. to alternating current power at a frequency of 833,000 cycles per second (360 meters wave length) which is supplied to the radiating system consisting of antenna and counterpoise. This high-frequency power in the antenna system sets up waves in the ether which travel outward in all directions and, intercepting the receiving antennae set up voltage and currents which operated the receiving set.

Figure 2 shows the circuit diagram. For convenience in studying the circuits

represented by Figure 2, which carry a wide variety of frequency, this diagram has been divided into four sections by means of the dotted lines at right; the lower section, which may be considered as the power supply, carries only direct current at 2,000 volts and low voltage alternating current at 25 cycles. This 25-cycle current is used only for heating the filament. To prevent any of the 25-cycle voltage being impressed on the grid filament and plate filament circuit, the return of the grid circuits and of the 2,000 volts circuit is connected to the mid-point of the resistor which is shunted across the filament, each half of the resistor being shunted by a condenser for by passing the radio and audio frequency.

In the next section of Figure 2, in addition to the power circuits described, audio-frequency voltage is impressed upon the grids of the modulator tubes varying the potential of these grids with respect to their filaments according to the voice waves, by means of the pick-up transmitter and amplifiers.

The four 250-watt power tubes in the upper part of the set are the oscillators, which, in conjunction with the condensers and oscillation transformer, change the 2,000-volt direct-current power into alternating-current power at 833,000 cycles (360 meters) generating the so-called carrier wave, which is pressed on the antennae through a remote controlled double throw switch, which allows the same antennae to be used for receiving when the station is not broadcasting. The amplitude of the radio frequency wave thus generated is constant so long as the plate voltage on the oscillator tubes remain constant, and fluctuates with the plate voltage when the latter is varied. Thus the upper section of Figure 2 carries only modulated radio-frequency waves, while the third section carries both radio frequency and audio frequencies, in addition to the 2,000 volt direct-current and the 25-cycle alternating-current power circuits.

The function of the five modulating tubes, also rated at 250 watts each, is to vary the voltage on the plates of the oscillator tubes according to the voice frequency impressed upon their grids by the speech amplifiers.

This system of modulation is known as constant current or power modulation and is accomplished by means of the constant-current choke coil in series with the positive lead of the modulator and oscillator tube plates. The modulator tube grids are held at a static potential of 60 volts negative with respect to their filaments by means of a battery. The audio frequency voltage from the speech amplifier then adds to or subtracts from this 60 volts grid potential. At an instant when the modulator tube grids have impressed upon them by the amplifier a small negative or zero, potential with respect to their filaments, the tube impedances from plate to filament are low and a large plate-current flows from the 2,000 volt direct current circuit to the modulator tube plates. Because of the large inductance (50 henrys) of the audio frequency choke coils in series with the plate supply, the total generator current can change very little in a brief interval of time. Hence part of the generator voltage occurs across the choke coils, thus lowering the voltage impressed on the oscillator tube plates and

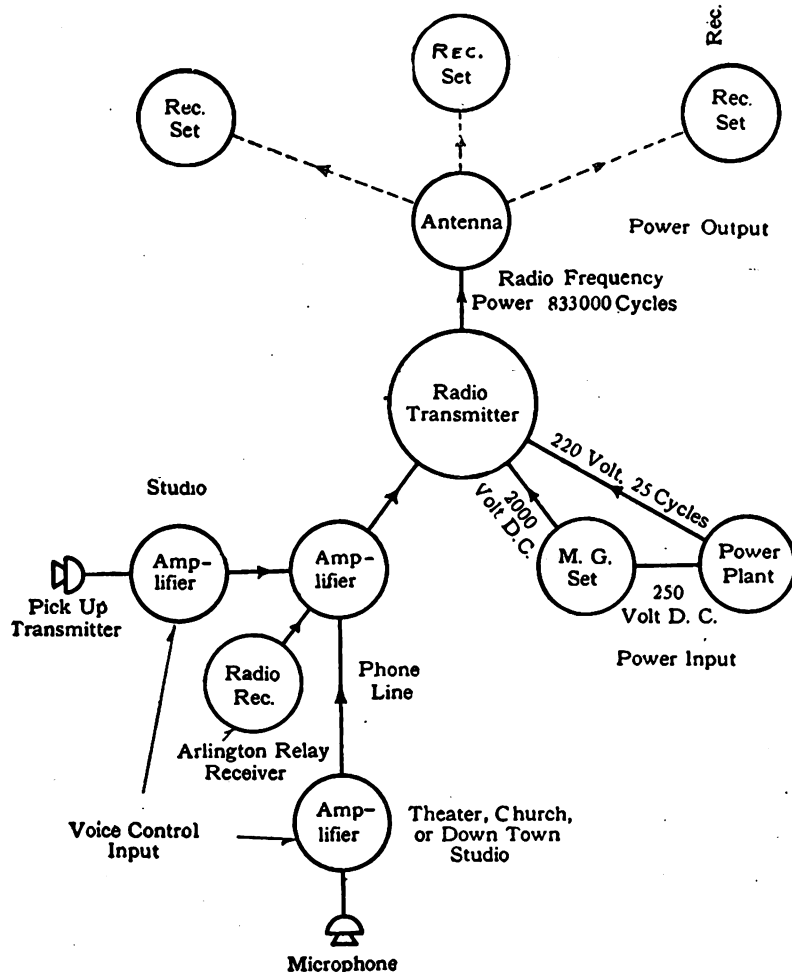
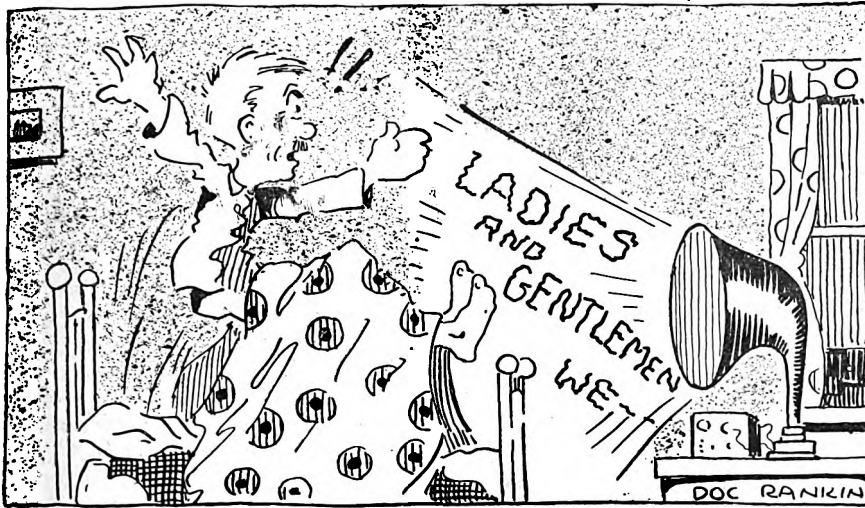


Figure 1. Diagrammatical form of the path of the speaker's voice from the studio to the receiving station. A voice picked up by the transmitter in the studio, theater, or church, is amplified and transmitted by means of a telephone line to the radio station, where it is further amplified and used to control the output of the radio transmitter.

He Forgot to Shut Down!



An original radio cartoon
Drawn specially for "Radio World"
By Doc Rankin

(Continued from preceding page)
hence the radio frequency output of the set. The next instant when the modulator tube grids have a high-negative potential with respect to their filaments the plate impedance is high and little or no current flows through the modulator tubes. The choke coils tending always to keep the total generator current constant creates a voltage which adds to the generator voltage and this forces most of the current into the oscillator tubes which increases

the radio frequency or antenna output accordingly. In this way the audio frequency choke coils cause the voltage applied to the oscillator tube plates to fluctuate in proportion to the speech voltage impressed on the grids of the modulator tubes by the speech amplifier. As the amplitude of current in the antenna varies directly with the plate voltage on the oscillator tubes and as this voltage varies from nearly zero to 4,000 volts the antenna current varies accordingly.

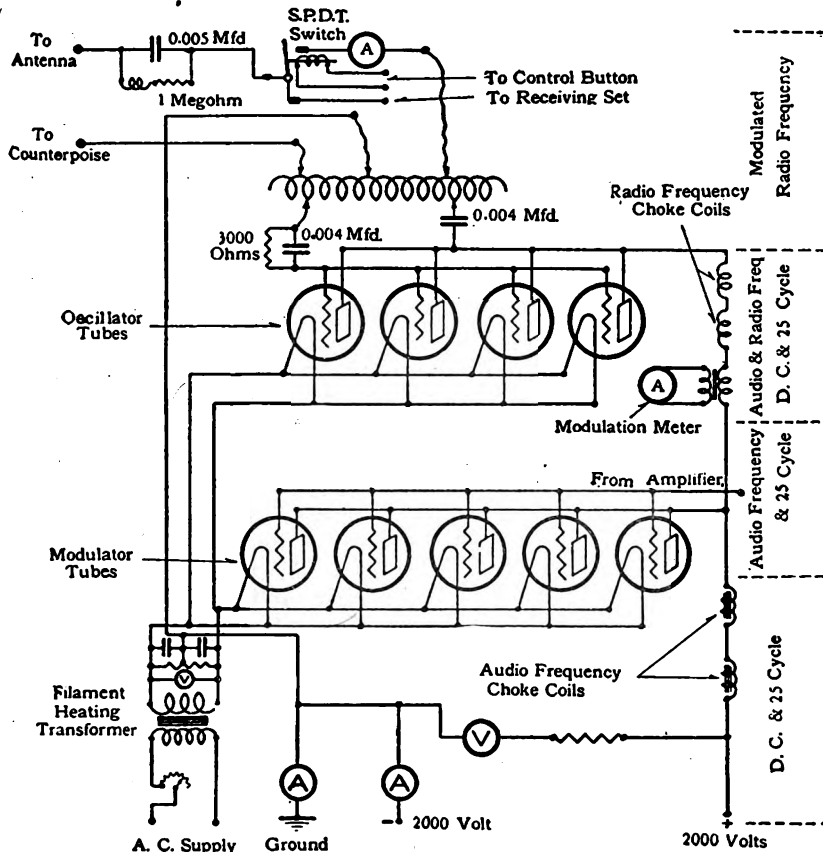


Figure 2. The circuit diagram. For convenience in studying the circuits represented by this schematic diagram—which carry a wide variety of frequency—it has been divided into four sections, indicated by the dotted lines at right. These four sections provide an interesting study for the

Radio Terms Stump Court

THE first radio litigation to come before the Boston courts went on trial before Judge O'Connell and a jury in the Suffolk superior court, says *The Tribune*, New York and aroused, first interest and then bewilderment, when highly technical terms were broadcast about the courtroom.

The suit was brought by Lloyd Green, of Everett, against the Radio Time Service, Inc., of Boston, for recovery of \$726 for work done. Green stated he was contracted with by the defendant to devise and develop loop antennae and other apparatus for the receipt of time signals from the Arlington, Va., government station without the use of outdoor antennae.

On the stand, Mr. Green plunged into a mass of radio phraseology which puzzled judge, jury and counsel to the extent that the court requested Mr. Green to explain just what was meant by antennae of both the plain and loop variety, radio-activity, ether and the like. Four o'clock came before the messages were decoded, and Judge O'Connell ordered a postponement until Monday to give the jury a chance to study radio technicalities.

A Homemade Grid

THE grid leak is a small filament of carbon in a glass tube; but the equivalent of this device, so important to radio, may be constructed at home very easily. How this is done is described by the *Sunday Call*, Newark:

Cut a piece of cardboard about two inches long and about half an inch wide, or just the size of the grid condenser. If the grid condenser is used, make the cardboard just as long as the condenser so that the two binding-posts will pass through the holes in the condenser and hold down the cardboard. Under each binding-post rub off some of the pencil carbon so that when the binding-posts are tightened down some of the pencil mark will show around the edge of the post.

Do this on both ends of the cardboard so that there will be contact enough for a pencil mark across the cardboard between the two binding-posts.

Turn on the tube filament and adjust the set. If a point is reached where the adjustment will cause a loud howling, or the signal tuned in is not clear, start rubbing the pencil back and forth between the binding-posts until the howling just stops or the signal is made clear.

If there is too much pencil carbon and the set appears dead, simply erase the marks and start all over again until the proper resistance is reached. The grid leak resistance need not be changed unless a different tube is inserted in the socket. Sometimes the grid leak made in this manner may be covered in hot paraffin so as to exclude moisture and it will remain in permanent adjustment.

Another method of making a grid leak is to soak a small piece of blotting-paper in drawing ink and dry it thoroughly. Then pass two binding-posts through the ends as with the other type mentioned above. A blotter inked in this manner cut down to 1/2 inch wide and 2 inches long will save a resistance of approximately one megohm, and is suited for the majority of tubes. However, the adjustable leak is to be preferred, for critical and efficient adjustment.

Subscribe direct or through your news dealer. \$6.00 a year, \$3.00 six months, \$1.50 three months. Radio World, 1493 Broadway, N. Y. C.

The Radio Primer

The beginner who follows regularly this department in RADIO WORLD will secure a liberal education in the applied principles of radio science

Radio World's Revised Radio Dictionary

By Fred. Chas. Ehlert

D. W.—Damped waves, the amplitude of which decreases as it travels.

Damped oscillations—This practically the same thing as damped waves.

Decrement, Logarithmic—This is the Napierian logarithm of the ratio in the amplitude of one oscillation to that of the next oscillation in the same direction in a damped wave-train.

Decremeter—An instrument used to measure the logarithmic decrement of a circuit of electromagnetic waves.

Detector—Any apparatus which transforms the oscillations received by the antenna into visible or audible sounds.

Diaphragm—A thin iron-disc in a telephone receiver, which sets up audible sound-waves from vibrations which are caused by periodic attractions of the magnets in the telephone.

Dielectric—The insulator between the metallic plates of a condenser. Every insulator is a dielectric.

Direct current—An electric current flowing continuously in one direction.

Discharge—To dissipate electric energy

from a condenser, cell, battery or any other charged body.

E. M. F.—**Electromotive Force**; or termed electrical pressure or potential, the unit of which is the volt.

Eddy currents—Currents in the pole pieces, armature, magnetic core, or other masses of metals which are rendered useless.

Electrons—Ultimate particle of negative electricity. It is the fundamental part in the constitution of matter as well as in the electric current. Ordinary currents are in some way an electronic phenomenon.

Electrical oscillations—An alternating current of high frequency; usually 10,000 cycles or more.

Electromagnetic Lines of Force—Those lines of force that act about an electromagnet, poles of a permanent magnet, or a wire carrying electric current.

Exciter—Used to excite magnetic fields of small-type generators.

Electromagnetic waves are waves in some electromagnetic disturbance traveling through space.

be purchased. This will keep you from placing it on charge so often. The B battery may be either a variable or a fixed 22½-volt battery. However, a variable is recommended.

* * *

Is galena the only crystal that can be used to hear broadcasting?

Among minerals there are others such as, carborundum, perikon, cerussite, iron pyrites, molbydenite, silicon, ferron, and, of course, the vacuum tube, which is not a crystal.

* * *

Do any of the above mineral detectors need any battery current?

Some crystal detectors, such as carborundum, need an applied battery-current for sensitive operation. A device, termed a potentiometer, is used to regulate the flow of battery current across the crystal.

* * *

Can a tube detector be placed in the same set and the crystal removed?

Yes. This may be accomplished easily. RADIO WORLD will always keep you posted on the uses of the vacuum tube.

Tips on Telephone Cords

TELEPHONE head-sets, at the terminal wires, have an extra piece of woven fabric which has been a puzzle to many. Some people don't know what to do with this little pig-tailed cord so they cut it off. However, this extra cord terminal has an important part to play.

It should be fastened to the binding post in such a manner that when the receiver terminals are pulled, the tension will be on the short end of the cord and not on the wire. This will prevent the tips from pulling off, something that happens frequently when the terminals are given a sudden yank.

Electric Currents

ELECTRIC currents are produced in several ways, the two most important being by electromagnetic induction, as in the dynamo; the other by chemical action. Electric currents are moving electrons. These electrons move along a wire, thus producing the current with which we are most familiar. They also move unattached through space from one point to another. This is what happens when a flash of lightning occurs. It is what goes on in the X-ray bulb and in the vacuum tubes used in radio-telegraphy and radio-telephony.

It is possible that electric currents may move through liquid, or gas, and carry parts of this liquid, or gas, with them.

The Beginner's Catechism

By Edward Linwood

WHAT would be the least number of pieces of apparatus that we could receive with?

All that is necessary is a crystal detector and a pair of telephones. The crystal detector is connected in, as a series circuit, with proper aerial and ground.

* * *

With such equipment, could I hear all the nearby broadcasting stations, also long-distance stations?

This cannot be accomplished with merely a detector. An oscillation transformer, such as a loose coupler or variocoupler, must be used. This, with the aid of detector and phones, would enable you to receive stations on short-wave lengths.

* * *

Would this enable me to tune—that is, weed out the undesired stations?

Yes. Either of the above instruments would enable you to weed out most of the undesired stations; but it must be remembered that no matter

what apparatus you may have—even within, say, five miles of some high-power commercial station—the weeding out of that particular station is impossible. Forced induction from such a station cannot be very well tuned out.

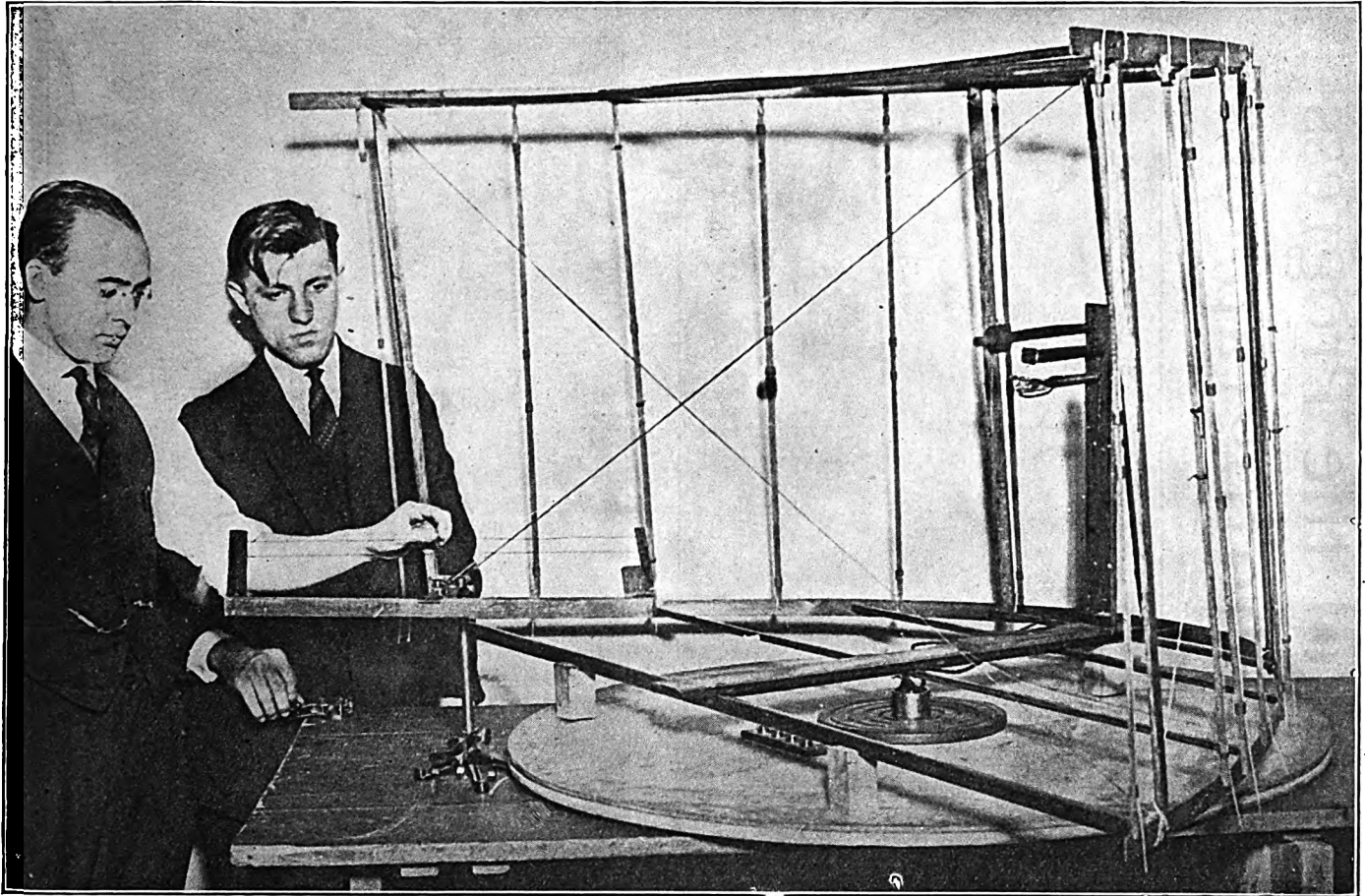
* * *

What size battery would be needed to light the filament of the tube? What size battery for the plate current?

When purchasing a battery for filament lighting a good six-volt battery with long amperage-hour life, should

The Radio Primer has been published regularly in RADIO WORLD since issue No. 1, and will be a regular department in order to instruct and aid the many thousands of amateurs who are joining the ranks of radio enthusiasts every week.

Marconi's Invention to Guide Radio



Radio and navigation experts are busy discussing Senatore Guglielmo Marconi's latest invention, the "radio searchlight," by means of which wireless waves may be focussed in a given direction in a beam, instead of being scattered broadcast. This means that Marconi's invention guides radio in a chosen direction. The photograph shows the new invention with an operator getting the wave length by a wave meter. The waves are directed by means of a reflector which throws a radio wave in about the same manner that a mirror reflects a ray of light. The set shown above is a practical model. It can throw signals a distance of twenty feet. Radio waves have been thrown by reflectors from London to Birmingham, England, a distance of ninety miles.

Reducing Strays *and* Statics

By Fred Chas. Ehlert

A GREAT deal has been accomplished by radio engineers and scientists in their effort to reduce the interfering noises caused by static and strays. At important government and commercial stations certain devices and methods are in use by means of which strays are considerably reduced.

The apparatus and methods now employed at such stations are usually too elaborate to be used at the ordinary amateur stations. One method which the amateur will find helpful in reducing certain strays is the use of a coil antenna—instead of the usual elevated antenna—and a more sensitive receiving set.

A suitable coil may be constructed by winding a number of turns of wire, with suitable spacing, on a square wooden frame about 4 feet square. Cer-

tain types of strays seem to come from a particular section, or direction. Many strays, however, have no directional properties, including those due to local electrical storms. The coil antenna has the property of receiving a stronger signal when pointed in the direction from which the signal is approaching; and of receiving only a weak signal when pointed at right angles to that direction. Thus by rotating a coil antenna to the proper position, the directional type of strays may be greatly reduced and a better ratio of signals to strays will be obtained.

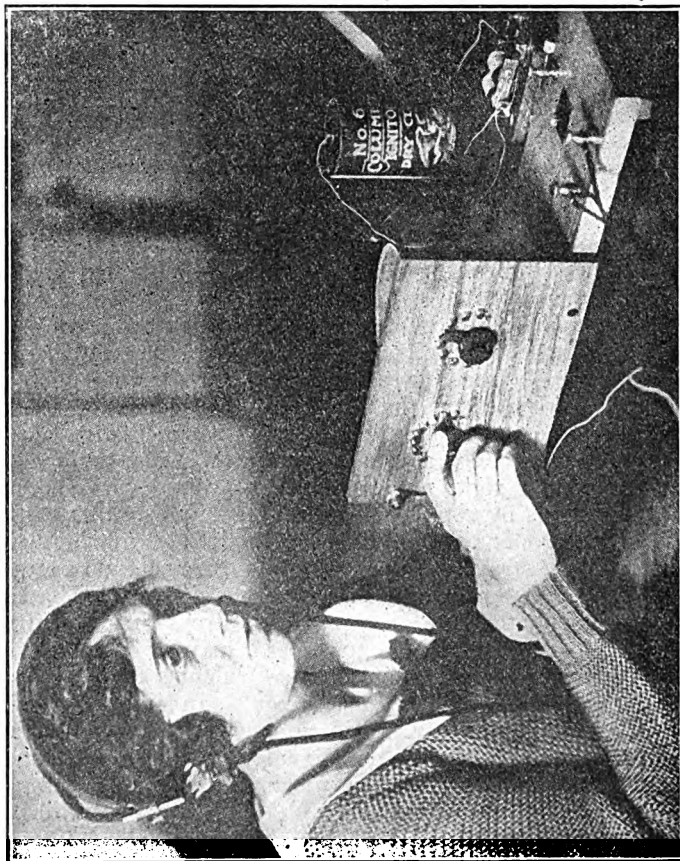
The ordinary elevated antenna does not possess marked directional properties and, therefore, cannot be used like the coil antenna for stray elimination. However, the strength of the signal picked up by a coil antenna is much smaller than that picked up by an ele-

vated antenna. Satisfactory results cannot be expected from a coil antenna unless three or more stages of amplification are used.

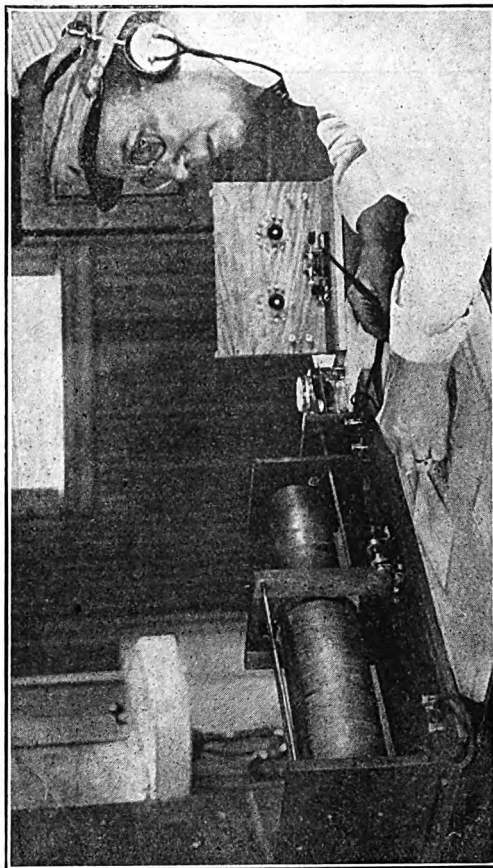
Some relief may be obtained by persons having good amplifiers by using the ground antenna. This is a long insulated-wire run in a shallow trench or on the surface of the ground. The ground wire should be run in the direction of the station from which the greater number of signals are to be received, and preferably should be several hundred feet long. Through strays of given intensity, better results may be obtained in receiving strong signals than in receiving weak signals.

In summer, one must be content with weaker signals and should use less amplification than in the winter. If considerable amplification is used disturbances will produce noises.

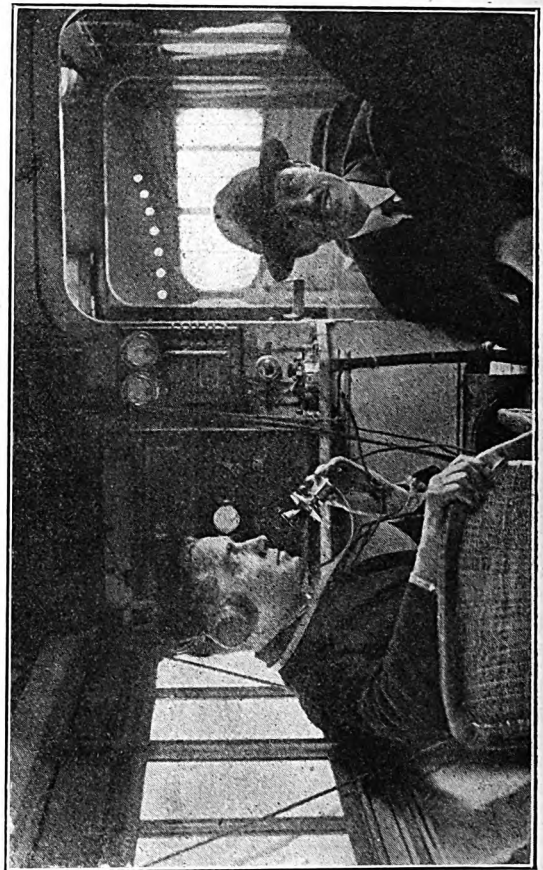
Radio World's Weekly Story of the Progress of Radio as Reported by Photographers



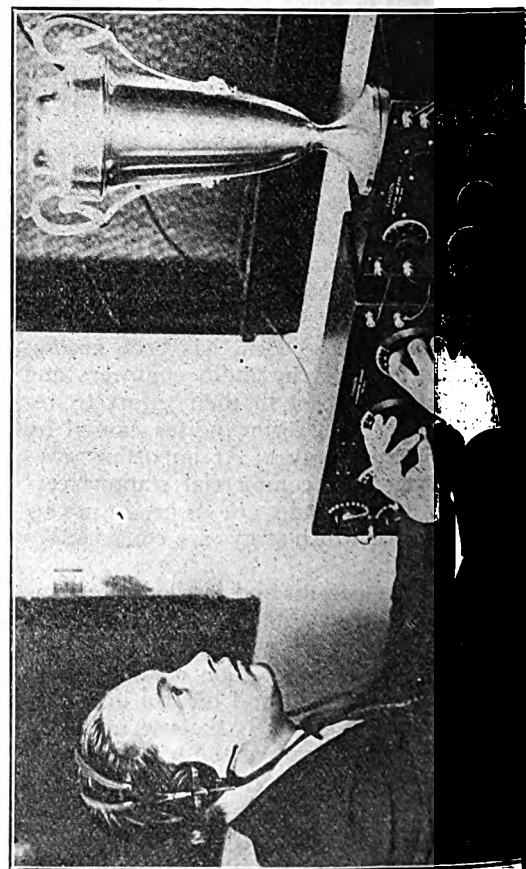
(Left): Miss Katharine G. Rice, market editor of the U. S. Department of Agriculture, photographed with the simple set she uses to check up broadcast reports.
(C. International)



(Right): George Cadwallader, New Jersey business man, and the home-made radio set he built in his spare moments. It has picked up Pittsburgh and Cleveland.
(C. Kadel & Herbert)

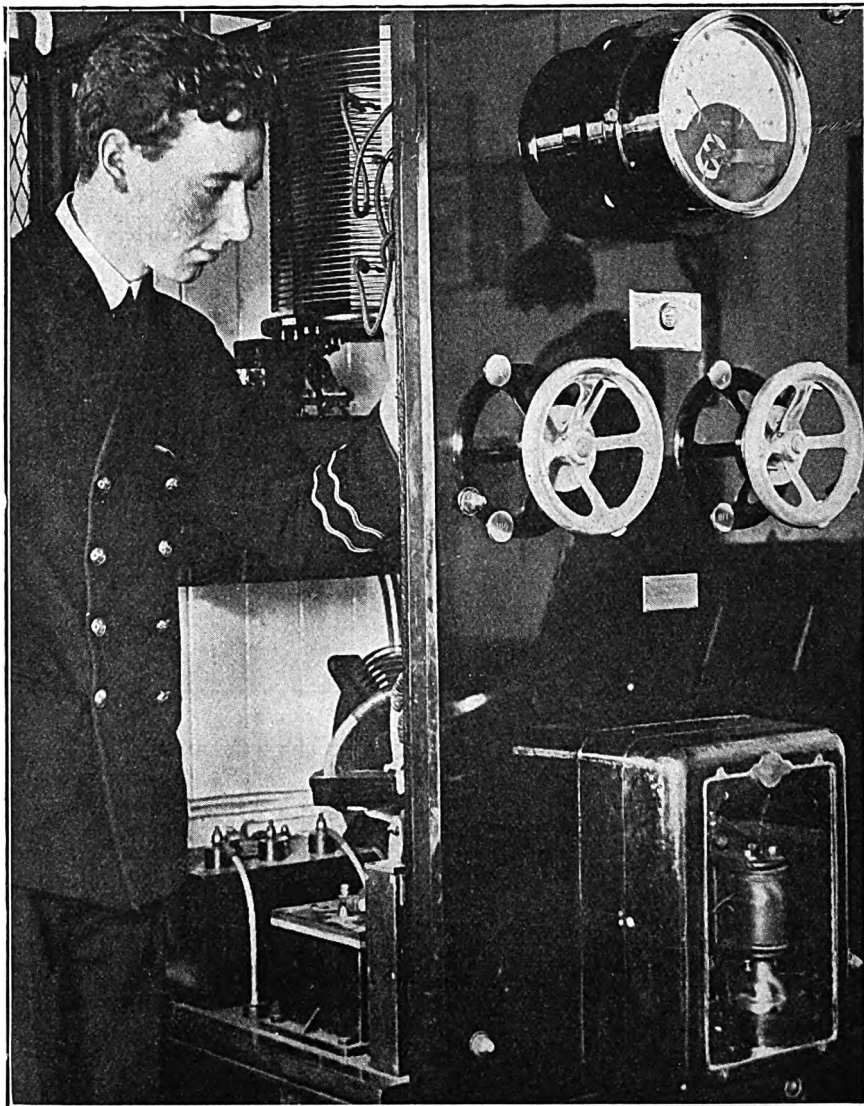


Interior of a Farnum Airplane equipped with radio for passenger service.
(C. Keystone)



George Frost, President, Lane Technical Radio Class, and the prize-winning set he made.
(C. Underwood & Underwood)

This Radio Compass Guided Steamer Three Days Through Dense Fog



(C. Ewing Galloway, N. Y.)

Transmitting apparatus on the liner "Orizaba," of the Royal Mail Steam Packet Company. This transmitter, along with the ship's radio compass, kept in touch constantly with shore stations of the United States Navy during three days of dense fog during a return voyage from Hamburg to New York. The transmitter has a sending radius of 1,500 miles, and the receiving outfit 4,000 miles. This equipment was put in by the Radio Communication Company, Ltd., of London. The "Orizaba" was steered through a fog that, much of the time, was so dense the navigator could not see a ship's length ahead. The liner passed many ships outside New York that were afraid to try to make port. D. McLellan, chief radio operator, is in this picture. Mr. McLellan, Third Operator E. Carmilo and Senior Second Officer R. V. Rutley did most of the work in the steering of the "Orizaba" during the three days of fog.

Talked 1200 Miles by Wireless in 1920

A. L. W. MAC CALLUM, manager of the Marconi Wireless Telegraph Co. of Canada, Ltd., in reviewing the history of wireless telegraphy, the utilities and conveniences it has provided as aids to navigation, commercial intercourse, and in the dissemination of press dispatches, states that the most sanguine supporters of Marconi did not dream that wireless telegraphy would develop to the

extent it has during the past twenty years. The usefulness and value of the new system of communication were soon apparent and wireless telegraphy was at once applied by the British Admiralty and Lloyds. The advancement of the science insofar as it has affected shipping was great, and today no vessel of any size was without wireless equipment.

While holding the view that the ques-

Our Own Broadcasting Station

OUCH for week beginning July 3, 1922

By Robert Mackay

7:01—Cradle stories for grandparents.
7:14—"How to Have Your Thumbs Manicured," by William Pinkerton. What every payroll bandit should know.

7:22—Song: Gasoline, My Gasoline! Words and music by the Standard Oil Company.

7:25—Trombone solos and how to cure them.

7:50—Drinking Song from "The Eighteenth Amendment."

8:02—Jack Dempsey posing for a photograph of himself.

8:16—Violin solo by the one-armed paper hanger.

8:27—What Babe Ruth said when Urban Shocker struck him out.

8:27½—Board of Aldermen distributing permits to eminent citizens to wear white socks.

8:30—New Jersey constable reading State's speeding laws to a New York automobilist.

9:30—Anti-Saloon League Quartette:

(a) "Have One More With Me," Brewer;
(b) "The Land Where the Wurtzburger Glows," Beer.

9:46—Smile on face of Mr. Average Citizen while reading this headline: "Your Winter Suit Will Soar in Price!"

10:00—"When I Threw Cocoanuts at Darwin," by William Jennings Bryan.

10:14—"How to Play Tiddletwinks," by Thomas A. Edison.

10:30—Beauty Talks to Deep Sea Stokers League.

10:45—Reading the current issue of the "Congressional Record," by Senator Watson of Georgia.

tion of safety at sea was the paramount benefit conferred by wireless telegraphy, other considerations, such as the facilities given for commercial and personal communication, and the means provided for keeping passengers informed of world events, were of such vast importance that the conditions of ocean travel had been revolutionized during the past two decades. Long-distance wireless had now been so perfected that high-powered circuits linked up every civilized country in the world. It is interesting to note that signals had been received at Melbourne, Australia, from the Marconi station at Carnarvon, in Wales, practically half way round the globe.

Wireless telephony was a natural development of the wireless telegraph, according to Mr. MacCallum, and bids fair to equal the latter in importance and usefulness. Although in its childhood, it had already made its voice heard 3,000 miles. The most notable demonstration was that specially arranged for the members of the Imperial Press Party on their voyage across the Atlantic on the Canadian Pacific "Victorian" in July, 1920. For 700 miles, direct communication was kept up with Chelmsford, near London, and when the "Victorian" was 1,200 miles from Newfoundland wireless telephone communication was established.

To many anxious inquirers RADIO WORLD has no free list. One copy is sent as a voucher to each advertiser or advertising agent represented in current issues. All other copies are paid for on subscription or through the news trade.

How to Solder Connections



(C. Ewing Galloway, N. Y.)

It is very important to know something about the simple but very necessary art of soldering when one starts to make a radio-receiving outfit. When soldering a joint these four points must be remembered:

First, the surfaces of the parts to be joined must be cleaned and polished.

Second, The surfaces should be treated with a soldering flux.

Third, The temperature of the soldering iron should be kept at the right heat.

Fourth, The metal parts should be heated with the iron, and just sufficient solder applied to cover the parts neatly.

Follow these precautions, and every joint will be a real joint. Your apparatus, connected with this care, will operate in a quiet and clear manner. In the photograph Mr. R. E. Leppert, Jr., of Harrison, N. Y., is soldering the parts of a two-stage amplifier, indicating how to apply the iron.

Radio Waves May Travel Around Earth

THE question as to whether it is possible to transmit radio signals around the world is one which has always fascinated me," said Guglielmo Marconi in his recent address before the joint meeting of the Institute of Radio Engineers and the American Institute of Electrical Engineers. Mr. Marconi discovered that "there is something in the idea of the wireless waves traveling around the earth in various ways and reuniting at the Antipodes." Sometimes these radio waves traveling around the earth in different ways re-enforce each other at the receiver, sometimes they interfere with one another. Tuning, however, overcomes the interference. The

station built by the Radio Corporation of America at Port Jefferson, Long Island, Marconi found, sent waves which "preferred to travel three-quarters of the way around the earth rather than come the shortest way round."

Static, a subject to which the research engineers of the Radio Corporation of America have devoted much study in this country, was also discussed by Mr. Marconi at this meeting. He told his hearers that there are particularly violent types of static over Africa and South America, but that static did not interfere very seriously in transoceanic communication in temperate zones.

"No, I am not surprised. Radio is only a natural growth—an essential in the progress of man. It will increase in value to him as time passes.—Edison.

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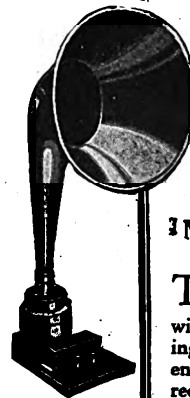
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SAME in principle and construction throughout as Type R-2, and is ideal for use in homes, offices, amateur stations, etc.

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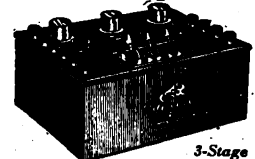


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**Magnavox
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INSURES getting the largest possible power input for the Magnavox Radio. Can be used with any "B" battery voltage which the power tube may require for best amplification.

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Radiograms

Latest Important News of Radio Garnered from the World Over, and Reduced to Short Wave-Lengths for the Busy Reader.

A CURE for cancer by the use of radio currents was announced before the meeting of the American Institute of Homeopathy, at its seventy-eighth annual session, at the Drake Hotel, Chicago. Dr. T. Howard Plank, Chicago, has performed the first treatments. He has the only machine in existence. "I use an electric scalpel—a departure in bloodless surgery," he said. "The current is the same as that used in sending radio messages. I have performed the operations with the radio current. The patient is out of bed in four or five days, and on the street in a week or ten days. Cancer operations with the knife, heretofore, have required two or three weeks in a hospital and two or three months before the patient was restored to normal condition."

Radio now lights the street lamps. "Carrier current," which travels at the speed of radio waves, and is an offshoot of the new science, has been used in Nahant, Massachusetts, to control its street-lighting system. Radio engineers proved that the street lights, four miles from the power station, could be turned on and off again by the mere pushing of a button.

Congress is about to enact new radio laws. A modified bill, presented by Representative Wallace H. White, Jr., of Maine, gives Herbert R. Hoover, Secretary of Commerce, a wide range of power to meet the changing situation until the art has been stabilized.

Freedom of the air is to be protected by a radio broadcasting society which seems to have the interests of the art at heart. This new organization, national in scope, is the Radio Broadcasting Society of America. The present headquarters are the offices of Charles Pope Caldwell, counsel of the society, 50 Church Street, New York City. The principles and bylaws of the Radio Broadcasting Society provides for the protection of the amateur, the listener in, and all others interested in radio. Its purpose is to prevent the control of patents to such an extent that progress is retarded, at the same time protecting the best interests of inventors and dealers.

Even Marconi is awed by the future of radio. He predicts that the equipment of today will be obsolete in another ten years. It was only ten years ago that Mr. Marconi selected New Brunswick, New Jersey, as a unit for his wireless company—and the event didn't create much excitement at that!

Radio has speeded up about ten per cent since then. Mr. Marconi says that it is beyond the power of the human mind to predict what man will be doing with radio ten years from now, to say nothing of a century.

Gaston Mathieu, Belgian wireless expert, is in America, the guest of Marconi. He says that America is leading the world in radio, but predicts that Europe will not be slow in taking advantage of all that this country is developing.

The broadcast program of WJZ (Newark) recently was picked up 300 miles at sea and furnished the entertainment aboard the yacht of a New York millionaire. It is reported that the sea was so calm, the owner's guests were able to dance to the music that came over the ether.

Many leading radio engineers of the world are now in America. They are here to study the advancement being made in the new science. They are a modest set of men, keenly interested in their mission.

Those who are devoting their lives to the blind hope that the radiotelephone will give every blind person the touch of companionship which their more wealthy fellow-sufferers enjoy. It is hoped that, at some hour each night, several chapters of the best books of the day may be broadcast, leading articles from the daily press read, and other instructive matter furnished through the air to those who have not the use of their eyes.

Davella, Martin County, Kentucky, has made an appeal for radio funds that it may hear broadcast sermons on Sunday mornings. Parnell Crum, treasurer of the Davella Community Organization, has made the appeal through "The World," New York. He says that the 300 human beings who live about Davella

are so cut off from the outside world that a number of them believe there is no such thing as radio. Mr. Crum has raised \$25. He needs about \$250 more. The people are poor farmers. The village is in a mountainous district, far from a railroad, and the poor roads prevent itinerant preachers from reaching it more than three times a year. It has no church.

Weather reports for the states east of the Mississippi River are now being broadcast. Weather reports are sent by telegraph code, using 5920 arc wave-length, at 10 o'clock in the morning and at 10 o'clock at night, using a 2650 spark. The forecasts will be those for New England, New York, Pennsylvania, New Jersey, Maryland, District of Columbia, North and South Carolina, Georgia, Florida, Alabama, Mississippi, Tennessee, Kentucky, West Virginia and Ohio. It is expected the radio forecasts will be picked up by amateurs and other operators for rebroadcasting by radiophone.

Radiotelephone communication between New York and London is only a matter of a few years. Marconi says that the accomplishment of this feat depends wholly on scientific investigation, the demand for such a service, and development of electric power strong enough to hurl the spoken word across the Atlantic.

A ninety-per-cent efficient radio connection is in operation between Berlin and New York. The gigantic stations—able to receive and send at the same time—work twenty-four hours a day. Each word sent out travels 3,000 miles through the air in the fraction of a minute.

It would cost over \$5,000,000,000 to send a radio message to Mars. And it would require 1,500,000 kw. on a 20,000-meter wave length. The message would travel the distance in less than four minutes. These highly interesting observations are based on information from Commander S. C. Hooper, in charge of radio communications of the United States Navy.

Two new radiophone ideas were introduced in Pittsburgh last week. (1) Radio music was used for the first time in a dancing academy. (2) Moving-picture houses flashed a simplified course entitled, "How to Make a Homemade Radio Set."

Paging guests by radio has been tried in a Boston hotel. Manager McCarthy, of The Essex, claims that the radio method gives more efficient service. Instead of the absolutely incomprehensible pronunciation of the "bellhop," the nomenclature of the desired patron is uttered in clear and distinct tones through a radio device attached to the hotel switchboard.

Radio apprehended a California crook trying to make his getaway aboard the outward-bound liner "America" last week. The police boat, "John F. Hylan," rushed after the speeding steamer, her radio call announcing her mission. Despite the tide, the big steamer slowed down while the police boat steamed alongside. Sleuths ran up the ladder. The culprit was located and brought back to face his accusers. Thus radio and retribution go hand in hand.

For the benefit of its 500 inmates, the New Jersey State Reformatory for Boys will install a complete radio-receiving outfit. "Good conduct" boys only will be permitted to attend.

A radiogram startled Mr. William Johnson, popularly known as "Pussyfoot" Johnson, prohibition plenipotentiary to the world, in his cabin aboard the Europe-bound steamer, "Scythia," last week. Before his departure, Mr. Johnson told a reporter for "The World," that he was not absolutely opposed to light wines and beer, and that he liked a glass of rye as well as anyone else. Ransom H. Gillett, general counsel for the Association Against the Prohibition Amendment, radioed Mr. Johnson congratulations and invited him to join the association in its work. Mr. Johnson declined by radio.

One of the twelve Pullmans carrying the Mystic Shriners, of Cincinnati, to the convention in Los Angeles, was equipped with radio. Aerials, 160 feet long, were swung eight inches above the car's roof. Broadcasting was heard daily, and the long-distance record was made at Santa Barbara, California, when the radioman picked up messages from the United States station at Annapolis, 3,000 miles away.

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New York Radio Pilot Cable Found O. K.

A RECENT test of the radio piloting-cable in Ambrose Channel, New York Harbor, showed that the mass of a large steel ship does not materially affect the audibility of the signals picked up from the cable, and that greater power in the cable is not necessary.

By means of underwater sound-detecting devices, a ship is enabled to keep practically over the submerged cable from which signals are constantly sent out through the water. There is a receiver on each side of the ship's bottom, and when one signal is weaker than the other the course is changed slightly until they are equal in intensity. In this manner a ship can proceed up the Sound even in dense fog.

As only tests with comparatively small steel vessels and tugs had been conducted by the Navy Department heretofore, it was feared that the mass of a large steel ship would absorb the magnetic field set up by the cable with the result that no signals would be picked up by the ship's receiving coils. The experiments, which were conducted by Naval officers from New York on the U. S. S. "Manchuria," also demonstrated that in the case of two ships passing each other, the absorption of the second ship would not reduce the strength of the signals received by the first.

Marconi Explains His "Talks with Mars"

NO doubt the public will always associate Senator Guglielmo Marconi's famous radio-equipped yacht, "Electra," with the reports sent out that he was endeavoring to communicate with the planet Mars, because of the great power of his instruments. This is due to the remarks which Marconi jokingly made while discussing the subject with a newspaper man, in Europe, who was not acquainted with radio.

At the time, Marconi announced that he had succeeded in recording electromagnetic waves 150,000 meters in length while his yacht was in Mediterranean waters. Waves of this length had never before been recorded, and special apparatus was necessary to get them.

In discussing the matter, recently, Mr. Marconi said: "I was only joking when I said in amplification of this was: 'These My little joke was taken seriously. What I said in amplification of this was: "These very long waves are entirely different in their characteristics to any that are produced on the earth." I was quite convinced that they came from outside the world. Just what they were I have no idea. They might be the result of some vast electrical disturbance in the planets, or from the sun."

COIN MONEY MAKING RADIO PARTS

COIL WINDING LATHES \$5.00 COMPLETE. PREPAID. Same type used by all manufacturers of coils, variometers, variocouplers, etc. Has 8" bed, 7" swing with legs for bench mounting, adjustable tail rest, two adjustable tube and reter chucks, scientifically counterbalanced fly wheel for hand or motor drive, automatic wire spool holder and feeder. Will wind any coil, reter or sector up to 6" diameter and up to 20" long. Will produce a tight even wind. Extremely simple to operate, is accurate, strong and reliable. The best materials and master workmanship are used throughout. Coin money making coils, variometers, variocouplers and other radio parts, this is the only machine necessary to do the work. Comes absolutely complete ready for instant operation with full instructions. Immediate delivery. Satisfaction guaranteed. Send \$5.00 cash, check or money order today for this wonderful bargain. Act quick.

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If you happen to have a few copies on hand, keep and display them and you will find that they will sell. Very shortly it will be impossible to get back numbers of these earlier issues.

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Radio Merchandising

Let "Radio World" Test Your Goods

If They Are Right, Our Endorsement Will Help You Sell Them

MANY buyers of radio goods have been "STUNG." Have at some time bought something that was not right or would not work.

Inexperienced manufacturers have rushed into the manufacture of radio goods in the past six months while the public in its eagerness to buy has been willing to take almost anything. Buyers are now twice shy and cautious. They want to KNOW the goods are right before parting with their money.

Our seventy thousand radio buyers who read RADIO WORLD each week, have faith in it. They know that RADIO WORLD does no merchandising, has nothing to sell, that its opinions cannot be bought. Therefore, RADIO WORLD'S endorsement means something.

Manufacturers, send a sample of your goods to our Technical Editor, Fred Charles Ehlert, 9006 Pleasant Street, Queens, Long Island, N. Y. It will be carefully tested and returned. If your goods satisfy our experts, RADIO WORLD'S endorsement will be published in our merchandise department without charge or obligation of any kind on your part.

Radio at Business Conventions

A NOVEL feature will be added to two conventions of business men on July 11 and 12, if the present plans of the Department of Commerce carry. The New England Shoe and Leather Association Exposition and an import and export exposition, are to be furnished by radio with the latest news of foreign markets and trade opportunities, through the Arlington Radio Station. This information, received from abroad by the Department of Commerce, will be broadcast from Arlington (NAA), July 11 and 12, at 8 p. m., on a wave length of 2650 meters.

Is Radio "Hardware?"

JUST how does this radio wave affect the retail hardware merchant? Just how far should the progressive merchant go in his effort to get his share of the tremendous radio business now and hereafter? Is radio logically within the province of the hardware merchant?

On the fact of it, it seems obvious that radio apparatus and equipment should come under the general heading of "hardware." In the smaller outfits, where no electrical current is used, this is easily seen. In the larger radio sets, where batteries are necessary for best results, these outfits might be termed "electric supplies." But "electrical supplies" and "hardware" are accepted as within the same general category. Further, most hardware men find it practical as well as profitable to carry both classes of goods—Alex Eisemann, treasurer, Freed-Eisemann Corp.

To Whom It May Concern

E DITOR, RADIO WORLD:—We have received a letter and circular describing a Permanent Radio Exposition, a Radio Dance Hall, and a Radio Theatre, and stating that these will occupy an entire floor of Grand Central Palace.

This was sent out by Aubrey Kennedy, of 516 Fifth Avenue. He calls it a "Radio Rendezvous." He further states that 30 per cent. of the space is already optioned by equipment manufacturers.

No lease has been made with Aubrey Kennedy, nor has any application been made by him or by anyone else for a permanent Radio Exposition, or Radio Dance Hall, or Radio Theatre in Grand Central Palace.

We are informed he has sent similar letters and circulars to radio dealers.

The above information is being sent to you in order that you may advise your readers and advertisers who manufacture or deal in radio equipment, of the facts.

We have, however, leased the Grand Central Palace to the America Radio Exposition Company for a large International Radio Exposition, to be held December 21 to 30, 1922.—(Signed) Robt. M. Catts, president.

Spark Sets for Sale

THE Shipping Board is offering for sale 78 complete radio spark sets formerly used on its wooden war fleet, and estimated at a total valuation of \$250,000. The sets are 1/4, 1 and 2 R. w. sets and include transmitters, batteries, and generators. They are located at Norfolk, Virginia, and may be examined by applying to B. N. Rock, 1025 Water Street.

New Firms and Corporations

Notices in this department are considered as purely interesting trade news and published without compensation to us. We welcome trade news of this nature. All notices having an advertising angle are referred to our Advertising Department, and are placed under Classified Advertising at 5 cents a word, or as Display Advertising at \$5 an inch.

(The firms and corporations mentioned in these columns can be reached by communicating with the attorneys, whose addresses are given whenever possible.)

The Gopher Radio Corporation, a \$50,000 organization for the manufacture of radio products, filed its records at St. Paul, Minn., on May 26, 1922. Henry E. Horowitz, 915 Merchants Bank Building, St. Paul, Minnesota.

Electrad Corp. of America, Manhattan, general merchandise, \$10,000; M. H. Cooley, S. V. Shoule, L. O'Connor. (Attorney, J. L. Pinks, 233 Broadway, N. Y.)

Duplex Radio Phonograph Co., New York, instruments, \$500,000. (Registrar and Transfer Co.)

Radio Magazine Corp., Manhattan, \$50,000; F. Clapetti, L. Benedette, D. Seals. (Attorney, S. J. Isaacson, 59 Wall St., N. Y.)

Intercity Radio Telegraph Co., New York, has increased its capital from \$1,000,000 to \$5,000,000.

Standard Wireless Instrument Co., 617 North Goodman St., Rochester, N. Y. R. T. Searing, president and manager.

A. C. Lopez & Co., 334 Fifth Ave., New York, N. Y. "Started recently as a radio contractor and purchasing agent, and going good," writes Mr. Lopez.

The Chicago Radio Laboratory, 332 South Michigan Ave., Chicago, manufacturers complete radio receiving sets. "We are the only manufacturers in the Middle West licensed to manufacture under the Armstrong patents. Our present output is more than 300 receiving instruments per day. Every set as shipped by us is complete, including batteries, headphones, tubes, etc.," writes Mr. P. A. Riley, of the company.

Jones Radio Corp., Brooklyn, \$50,000; R. A. MacLean, F. H. Butethorn, J. L. Watson (attorney, F. J. Knorr, Albany, N. Y.)

Independent Radio Manufacturers, New York, information in the radio art, \$5,000. (U. S. Corporation Co.)

Radio in the "Movies"

RADIO Films, Inc., 6381 Hollywood Boulevard, Los Angeles, California, is producing a series of two-reel educational comedies based on the science of radio. Each picture will teach a direct lesson as to the construction and operation of various kinds of receiving and transmitting radio-apparatus.

In the first three series, the Hatton boys are featured in the main roles; and the pictures, in addition to portraying an interesting story with educational value, have a question-and-answer department, in which Radio Films shows, by actual operation and animation, the answers to knotty problems that confront the embryo radio fan. The radio apparatus used in the pictures actually works and is not props, the instructive sub-titles spoken are correct.

Otto K. Oleson, vice-president of the company, is an electrical engineer, and is manufacturing radio apparatus and all instruments are constructed under his direct supervision.

Trade Notes

IT has recently been estimated that radio business will reach the \$70,000,000 mark this year. Inasmuch as government officials look for many times as much business next year, the enormity of radiotelephony's importance can be grasped at once.

Jacob Loving, of 610 Broadway, New York City, was high bidder for the 30,000 surplus vacuum transmitting tubes offered for sale by the Navy department at Brooklyn. He bid \$4.0069 each, for all or none. The lowest bid was 10 cents each, made by L. M. Alexander, of Cincinnati.

Answers to Readers

WHERE may I buy a radio-frequency transformer capable of handling waves from 150 meters to 25,000 meters? Should a panel be wired with bare or insulated wire? Which do you consider the best vacuum tube—radiotrons or A-P tubes?—Maxwell Murphy, Eastport, Maine.

Radio frequency, being in a stage of experiment, is one of the important problems fazing the radio experts of the country. At present, there is no radio-frequency transformer made that will cover the band of wave lengths you state. These transformers differ. One transformer will operate on a certain wave of 360 meters, while others operate on 400 and 500 meters. Radio-frequency transformers have not yet been developed to respond to a wide band of wave lengths.

A panel will work and appear much better if the wiring is insulated and run through spaghetti tubing.

Regarding the tubes now on the market, it seems to be a hard debate which is the better of the two. In some recent letters received, the radiotron was used with amazing results; while, on the other hand, preference was given the A-P tube.

I believe if either tube is used correctly, satisfactory results should be obtained.

* * *

I have a 65-foot aerial wire, a tuning coil, crystal detector, fixed condenser and telephone. The only thing I hear is a humming noise, similar to a telephone hum. What is this? What should I do to hear music or, at least, code?—William C. Utz, Westminster, Md.

Your diagram is not drawn clearly. I refer you to RADIO WORLD, No. 13, dated June 24. Read the article, "How the Crystal Detector Is Used to the Best Advantage," by C. J. Williams. Be sure you do not connect your ground on the same ground with telephone wires.

* * *

I have a crystal set consisting of a loose coupler which I built myself. The primary

is 8 inches long and 5 inches in diameter; the secondary is 7 inches long and $4\frac{1}{2}$ inches in diameter. I have fixed condenser, crystal detector, and 2000-ohm phones. How is that I hear WJZ (Newark, N. J.), but not WVP, Fort Wood, N. Y.?—William Oetjen, Ingleside, N. Y.

Fort Wood operates on a wave length of 1450 meters, and you should seek this wave length. Evidently our aerial is short, or you are not tuning sharply enough. We suggest using a 23-plate variable condenser in shunt to primary and secondary.

* * *

Why is it that I cannot hear Newark, N. J., with the following equipment: 40-foot aerial, 2-slide tuning-coil, variable condenser, 2 fixed condensers, crystal detector, and 2200 phones.—Donald Mershrad

Evidently you have wrong circuit. See RADIO WORLD, dated June 10, No. 11, in which George W. May describes the single- and double-slide tuning coils.

* * *

What is the wave length of my set. Primary, 8 inches long by 3 inches in diameter; secondary, 8 inches by $2\frac{1}{2}$ inches? No. 24 wire was used on the primary, and No. 28 on the secondary.—Joseph Murck, Philadelphia, Pa.

The wave length of this set should enable you to receive up to about 2000 meters. This would cover all the broadcasting stations using high wave lengths.

* * *

Would a two-wire aerial, 60 feet long work better if connected at both ends? What would be the advantage?—Harold Farasch, Poughkeepsie, N. Y.

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Coming Events

The editors of RADIO WORLD will gladly publish news items of all contemplated radio shows and expositions. Keep us posted by mailing full information.

ANNUAL SHOW OF THE ST. LOUIS RADIO ASSOCIATION, St. Louis, Mo., October 4 to 7, inclusive.

CHICAGO RADIO SHOW, Coliseum, Chicago, Ill., October 14 to 22. U. J. Hermann, managing director, 649 McCormick Building.

INTERNATIONAL RADIO EXPOSITION, Grand Central Palace, New York City, December 21 to 30.

KANSAS RADIO EXPOSITION will be held at the Kansas State Fair, Hutchinson, Kansas, September 16 to 22 inc. A. L. Sponsler, secretary.

MERCHANTS' COOPERATIVE ADVERTISING AGENCY RADIO SHOW, Robert Treat Hotel, Newark, N. J. Date not set. Will be held late this year.

"RADIO DAY," Pittsburgh, Westview Park, August 24. Under auspices of Radio Engineering Society. C. B. Urban, secretary.

RADIO CLUB OF AMERICA. First autumn meeting will be held the last Friday in September. Renville H. McCann, secretary, Columbia University, New York.

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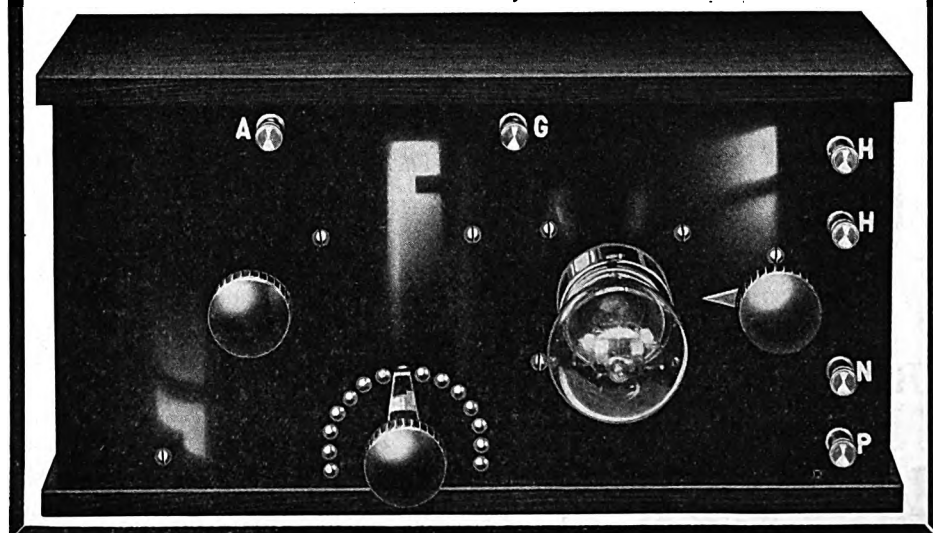
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Amateur Radio Directory of the U. S. Complete list of Amateur stations with names and addresses of operators or owners. Prepaid for \$3.00. Names and addresses are guaranteed 98% correct will refund postage on all mail returned as undeliverable if less than 98%. Remit with order.

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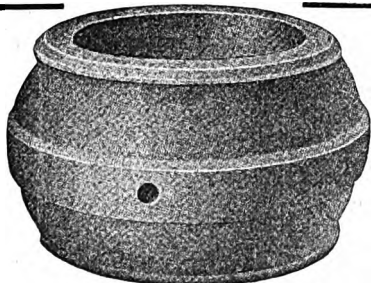
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Navigating the Directed Wave

SO many Americans are interested in radio broadcasting that, in describing before a group of engineers his new apparatus for directing radio waves, says *The World*, New York, Mr. Marconi addressed through press reports an unusually large non-scientific audience capable of catching the possibilities of the device.

Broadcasting Mr. Marconi compares to diffused sunlight; directing radio waves to the searchlight, concentrated in intensity and thrown far in a pencil of radio-activity by the reflector. A system "to a very large degree secret" which can thus direct the waves should succeed in reducing the danger of jamming the air by conflicting currents of similar wave length sent broadcast. In navigation the directed waves, repeated from the receiver, could be made to reveal the exact bearing of a lighthouse in case of fog, and even its distance from a ship at sea.

In the opinion of specialists, the astonishing development of air communication since the war is only at its beginning. It seems probable that the most useful developments of the immediate future will be aimed rather at precision than power; rather at means of preventing clashes in the use of the air than at sensational and exceptional feats of girdling the earth. Decidedly the pencil-radio idea has possibilities.

Ripples vs. Billows in Radio

IN wireless, electric energy is flashed into space in waves. The distance from one wave crest to another is called "the wave length." It is usually expressed in meters. In these days, when radio is attracting millions, the wave length may be anything from 200 to 20,000 meters. In other words, the ether of space is shaken into terrific billows compared with which the mightiest upheavals of the ocean are mere ripples. As far back as 1895 and 1896, Marconi obtained some promising results with waves not more than a few inches long. He has returned to his original idea of using short waves for further experimenting.

Resonance Wave-Coils

DESCRIBING the device known as resonance wave-coils, Dr. Louis Cohn, consulting engineer of the United States War Department, said that it is practically, a long coil, the length of the wire used being comparable to the length of the wave which is being received. The coil which stands vertical is enclosed with short metal tubes which slide up and down the coil, and are grounded through certain circuit arrangements which act like a drain for the static currents but permit the signals desired to be received to pass through to the detecting instrument. The device can be used either with a lighting circuit used as a receiving antenna as described by Major-General George O. Squier, U. S. A., or in connection with a regular receiving aerial. A great future is seen by experts for the recently developed static eliminator, as by grounding the noisy static, which has interfered with the reception of radio signals for years, the incoming signals are left clear and distinct.

First 14 Numbers of Radio World

If you did not get copies of *Radio World* No. 1 to No. 14 send us \$1.80 and we will send you this paper for one year, (\$6.00 for 52 issues) and start it with our first issue, which will be mailed you as soon as possible after receipt of order.

IT WILL PAY YOU

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Mahogany wood turned cup, white wood ball ready for wiring. Range 175 to 600 meters. Ready for immediate delivery in any quantity. Workmanship guaranteed.
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Do Motor-Cars Interfere with Radio?

MARCONI has made the claim that, when very short waves are used, disturbances caused by static can be said to be almost non-existent and the only interference comes from the ignition apparatus of automobiles and motor-boats. "The day will come when we will have to screen our ignition systems or carry a government license for transmitting," he says.

Marconi's Radio Lighthouse

MARCONI claims that a revolving transmitter and reflector will act as a kind of wireless lighthouse, or beacon. "By means of the revolving beam," he says. "it is possible for ships to ascertain in thick weather the bearing and position of the lighthouse."

A Family Radio Success

WE inspected a combination radio and wireless receiving and sending station in the home of a Lincoln resident recently," said the editor of *The Nebraska Farmer*. "The two boys in the family, with the help of their father, have installed the apparatus, and with the key, that is the telegraph code, they have been able to communicate with every State in the Union. Through the radiophone they have heard clearly concerts from Detroit, and Pennsylvania cities, and other distant points. On one occasion their voices were heard at a point nearly 1,000 miles away."

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Factory, offices and demonstrating rooms, Testimonials open for inspection. Strictest investigation invited. Call or write for information.

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Latest broadcasting map, 15c. That is, a complete broadcasting map appeared in RADIO WORLD, No. 8, dated May 20. Mailed on receipt of 15c. Radio World Company, 1493 Broadway, New York City.

National Radio Club Organizing

PITTSBURGH—A club that seems destined to play a big part in the future of radio is being organized here. While one of its fundamental purposes is to promote and finance the installation of radio equipment in hospitals, it will also use its influence to keep the broadcasting art on its present high plane; enlarge musical and educational radio programs; keep all members informed regarding developments, improvements and news of interest regarding radio; answer, without charge, all technical questions asked by members; receive and file articles written by members for reference; lend the moral support and influence of the club to those agencies endeavoring to eliminate the confusion of signals; promote fraternity and good fellowship among members with the aid of a distinctive official button and card of membership. It is to be called the National Radio Club. It proposes to weld the nation's army of radio enthusiasts into one compact body.

The organization committee includes Harold B. Coe, New York City; Charles W. Payne, Philadelphia; F. R. McCray, Los Angeles; Otto J. Palm, Cincinnati; R. Gordon Craig, Ray Mansmann, and Francis G. Albertson, Pittsburgh; radio enthusiasts who are sparing no effort to promote the interest of radio transmission.

Although the club has been assured the hearty co-operation of large manufacturers it will maintain a strictly neutral attitude in all matters of equipment. Its officers and directors will be selected from radio enthusiasts not engaged in making or selling radio apparatus.

A nominal membership fee of \$2 will be asked. Applicants should address Francis G. Albertson, secretary, 419 Fulton Building, Pittsburgh, Pennsylvania.

First Radio Waves Pro- duced in U. S. in 1871!

TWELVE years before Heinrich Hertz announced his radio discoveries, Professor Elihu Thomson, a professor of chemistry in a Philadelphia high school, produced and operated the first apparatus to transmit electro-magnetic waves through space without wires.

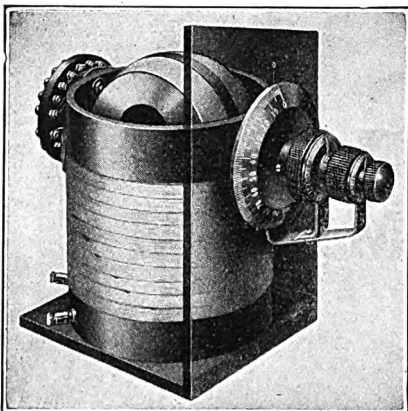
This statement is made by Professor L. M. Knoll, now head of the physics department of the Central High School, Philadelphia. According to Professor Knoll, it was Professor Thomson, now director of the Thomson Research Laboratory of the General Electric Company, in Lynn, Massachusetts, who successfully demonstrated that electrical impulses may be transmitted without the use of wires, at least twelve years before the announcement by the German scientist, Heinrich Hertz, of the University of Bonn. Hertz, in 1887, informed the scientific world of his discovery that electro-magnetic waves sent out by induction coils or other suitable apparatus may be caught by a receiving apparatus without the use of wires.

Following up the experiments of Hertz, Senator Marconi produced the first practical wireless apparatus and adapted it to commercial use. Professor Thomson, according to Professor Knoll, made no practical application of his work, but conducted it solely as an experiment.

In "The General Electric Review," May, 1915, Professor Thomson describes his experiments with the first radio set. His statements are corroborated in an article in the issue, dated March 20, of the same publication, by Professor Monroe B. Snyder, a former instructor in a Pennsylvania high-school.

In the early issues of the *Journal of the Franklin Institute*, for 1876, appear articles by Professor Thomson describing radio experiments begun as far back as 1871. Credit is given by Professor Thomson to his colleague, E. J. Houston.

An Epoch-Making Advance in Vario-Couplers



Selector Vario Coupler—3 units in one. Pat. Pending. Cat. No. 970
Show your customers this new development. It is an instrument of great accuracy and is the product of an organization whose engineers have had long experience in Radio Research.

The New Norris "Selector"

Every dealer should sell this new Norris "Selector" Vario-Coupler because it is an instrument each "Fan" will want. It combines in one compact unit, an efficient and accurately designed vario-coupler and the necessary tuning switches. It is actually three instruments in one as separate controls are provided for both the coupling and each of the two primary switches.

The "Selector" works easily and gives a very fine adjustment on each of the three controls.

Radio Fans can easily install this new Vario-Coupler on their sets with a great saving of panel space. Radio Jobbers and Dealers—

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For perfect results in receiving nothing can beat the PAN AUDIO Type 102. Here is a real Vacuum Tube Receiving Set for the Radio Enthusiast who knows what he wants at the right price.

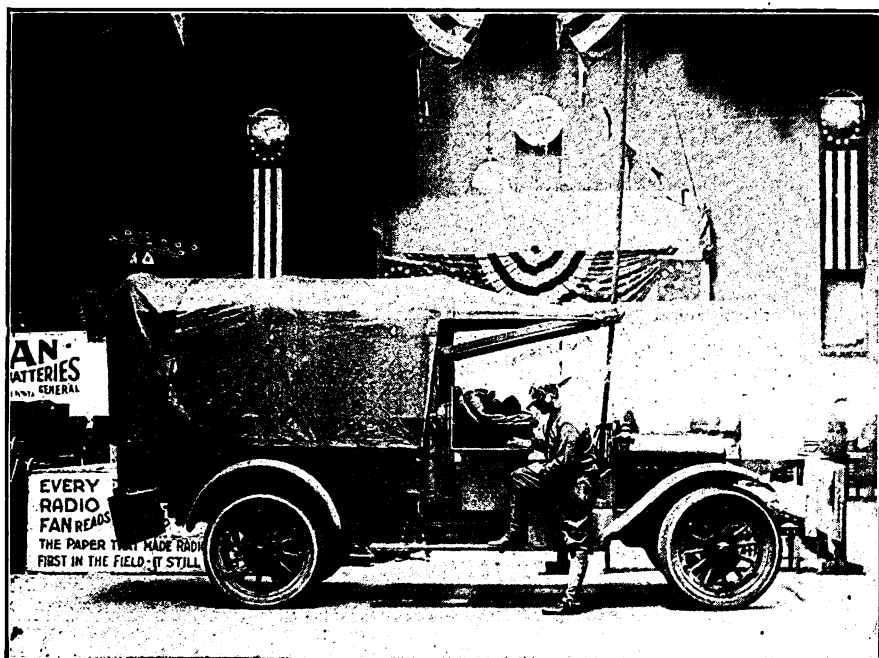
The PAN AUDIO Receiver combines power, appearance, durability, efficiency, freedom from vibration and distracting noises. Made of solid mahogany, with panel of best grade bakelite, beautifully engraved. Permits a wave length range of from 175 to 5,000 meters, enabling you to receive from the broadcasting stations at Newark, Schenectady, Pittsburgh and others at greater distance.

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Army Truck Radio Equipped



(C. Keystone, N. Y.)

At a recent radio show in Greater New York an object of interest was an army truck radio-equipped. The mast, as shown in the photograph, is erected in front of the wheel. It rests on, and is fastened to, the motor foot-boards. The aerial is aloft and degrades down to the post, well-insulated, at the rear of the truck. With this arrangement signals can be received while en route.

Broadcast Bill's Radio-lays

By William E. Douglass

(Copyright, 1922, Westinghouse Electric & Manufacturing Co.)

THE other day I read about a certain brand of milk, the kind you buy in cans, you know; they said 'twas fine as silk. Their reason wuz, "Contented Cows." I couldn't quite decide just where they got their argument, 'cause I've always tried to give ours lots of pasture, and a special brand of feed; an' that's as much as any self-respectin' cow should need. I had the barn rebuilt

are wired for 'lectric light; it's dern near like a city when they're all lit up at night. I figgered an' I figgered what could that "contented" mean, then all at once an idee percolated through my bean. They say that Tommy Edison don't ever sleep a wink when workin' on a big idee, stays up all night to think. Well, mebbey so, but just the same, I'll bet a new straw hat, he sleeps straight through fer 'bout a week to get caught up at that. I come to the conclusion since their place to eat an' live seemed satisfactory all right 'twuz up to me to give my cows some entertainment. Now you see the reason why I got my set hooked up to give my radio a try. I fixed a pair of earmuffs so they'd fit on bossy's head; in evenin's now, at milkin' time out yonder in the shed, ol' boss an' me we "listen in" to singin' er a band. My cows are as "contented" now as any in the land. A few of my good neighbors wondered what results would be by milkin' a la radio, but you can plainly see that all the time they're listnin' they are standin' purty still an' fer a week er more I haven't had a spill. I don't mind milkin' and more since I can sit an' listen to stuff that's bein' broadcast I'd otherwise be missin'.

Radio Puts Over Real-Estate Deal

Unable to dispose of a good, but not modern, house in Dallas, Texas, notwithstanding alluring offers which brought no bidders, an enterprising real-estate operator equipped the old mansion with the very latest radio receiving set and so advertised in the leading paper. Replies came immediately and from dozens of offers he was able to dispose of the house with a good profit.

an' got it fixed up purty nice; I'll get a patent milker, too, when I can stand the price. The house an' barn an' all th' sheds



"A Marvelous Invention"

—say experts

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No tubing to rob the sound of its fullness; no horn, as on ordinary loud speakers, to destroy or distort the most delicate notes. Every sound is true, sweet, mellow and distinct to everyone in the room.

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FROM PUBLICATION OFFICE,
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ASSOCIATE EDITORS:

Robert Mackay Fred. Chas. Nhlert

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Receipt by new subscribers of the first copy of
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Advertising rates on request.

Entered as second-class matter, March 28, 1922,
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the act of March 3, 1879.

IMPORTANT NOTICE:

While every possible care is taken to state
correctly matters of fact and opinion in technical
and general writings covering the radio field, and
every line printed is gone over with a scrupulous
regard for the facts, the publisher disclaims any
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of technical problems, or other matters that may be
printed in good faith and on information furnished
by those supposed to be trustworthy. This state-
ment is made in good faith and to save time and
controversy in matters over which the publisher
cannot possibly have control.

The Lure of Radiotelegraphy

The novice is now beginning to realize
that the wireless telegraph stations, after
all, have a definite mission to perform,
and, moreover, he is becoming very inter-
ested in the nature of this mission, says
a writer in *The Tribune*, New York.

As a matter of fact, these telegraph sta-
tions are themselves engaged in broad-
casting also, and the material they send
out is particularly interesting. In a great
many cases it consists of the very latest
news which is being sent broadcast for
the benefit of ships at sea, and this news
matter is several hours ahead of the
news sent out by the radiophone broad-
cast stations. It would be of extreme
value to the rural dweller, and also inter-
esting to the city resident. Of course,
the news is only in bulletin form, but
it carries a little more detail than does
the radiophone broadcast.

In addition to this there is the lure of
listening to European wireless stations.
Unless the novice can read the Contin-
ental telegraph code he cannot tell what
station he is listening to, and there are
plenty of times that he may be actually
listening to a European station without
knowing it.

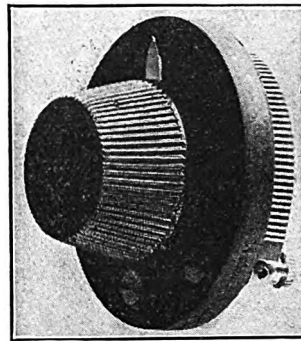
The European stations, and, also, the
American stations which are engaged in
trans-Atlantic work, use very long wave
lengths, ranging up to 15,000 meters, but
these wave lengths are not beyond the
receiving apparatus of some novices.
There is another class of station operat-
ing on much lower wave lengths, which
also send out news. These are stations
similar to the navy yard stations, which
operate on waves up to 2,000 meters. Ar-
lington, which can transmit across the
Atlantic, for instance, operates on 2,500
meters, sending out general information
to ships at sea.

Latest broadcasting map, 15c. That is, a
complete broadcasting map appeared in
RADIO WORLD, No. 8, dated May 20.
Mailed on receipt of 15c. Radio World
Company, 1493 Broadway, New York City.

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\$1.00

Resistance
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THE ONLY UP-TO-DATE

AMATEUR RADIO DIRECTORY AND CALL BOOK

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Broadcasting Stations of the entire Nine Districts of the United States.

ALSO

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How to Calibrate Your Receiving Set without the use of a Wavemeter.

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Department W.

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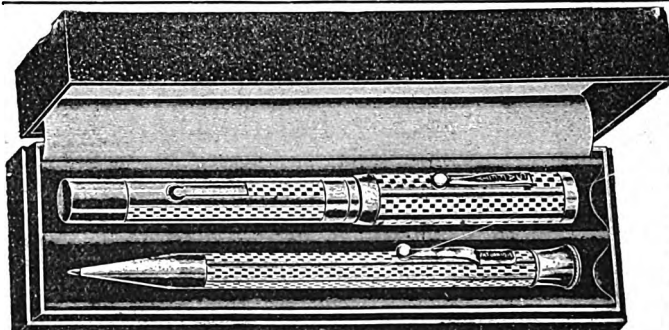
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**Marconi Moorhead
Electron Relay**

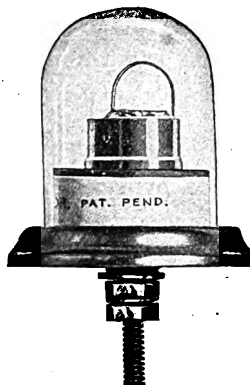
(Amplifiers and Detectors)

\$3.50**George H. Porell Co., Inc.**

364A Somerville Ave. Somerville, Mass.

**PRESCO**Sectional UNIVERSAL
Radio OutfitsLicensed under Armstrong
U. S. Patent No. 1,118,149The Set Consists of
Three Units:

Tuner and Detector Unit.... \$ 50.00
Two-Step Amplifier Unit.... 35.00
Unit for holding "A" Battery 9.50
Top and Bottom, which when
added to the three other
units, make a complete sec-
tional in one. Each, \$5; both 10.00
Complete Set, Total..... \$104.50
Ask your dealer; if he cannot supply
you, write us, Dept. 828.

**Does Summer Static
Bother You?**IT WON'T WITH THIS
RADIO DETECTOR

(Actual Size)

PRICE \$2.00In using the GREWOL you don't
have to find the spot.**THIS DETECTOR IS
ALWAYS SET AND READY**

**GUARANTEED ONE YEAR
IF YOUR DEALER DOES NOT
HANDLE THE GREWOL SEND
US \$2.00 AND WE WILL MAIL
ONE TO YOU.**

WRITE FOR OUR TRADE
PROPOSITION**RANDEL WIRELESS CO.**

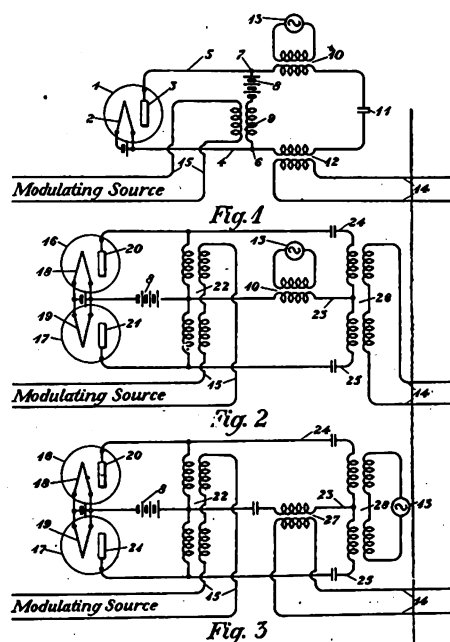
9 Central Ave. Newark, N. J.

Latest broadcasting map 15c. That is,
a complete broadcasting map appeared
in Radio World, No. 8, dated May 20.
Mailed on receipt of 15c. Radio World
Company, 1493 Broadway, N. Y. C.

Radio Patents

Just Issued

JOHN R. CARSON, New York City,
has invented a translating circuit for
signaling systems. It provides for a
translating arrangement for modulating
high-frequency oscillations, the modulat-
ing means comprising a two-element vac-
uum tube, or other equivalent device, hav-
ing unilateral conductivity. Another ob-
ject of the invention is to provide an
arrangement of this character capable
of use either as a modulator of high-fre-
quency oscillations in accordance with
signal waves, or as a modulating detector
for detecting, in accordance with the



Schematic diagram of the Carson trans-
lating circuit for modulating high-fre-
quency oscillations.

homodyne or heterodyne system of re-
ceiving modulated high-frequency oscil-
lations transmitted from a distant sta-
tion. Still another object of the inven-
tion has reference to the provision of a
translating arrangement of the character
just described in which the unmodulated
oscillations are ineffective upon the out-
going transmission circuit when the var-
iable modulating source is inactive, so
that when the arrangement is used as a
modulator, the amplitude of the transmit-
ted oscillations will be directly propor-
tional to the amplitude of the modulating
waves.

**Let Your Bed Springs Be
Your Harp**

IT is not at all necessary to be discour-
aged if you live in the kind of apart-
ment house where the landlord is unalter-
ably opposed to have antennae hung up on
the roof. The old, and generally service-
able trick, is to rig your receiving set to
your bed-spring, using that as an anten-
na. If you have a fairly efficient set, or
even one of the very small detector out-
fits, satisfactory results from this hoo-
up may be expected. If your bed-spring
is not available, you can still use your
fire-escape as an antenna—only first be
sure that you scrape the paint clean from
the point where you connect your detec-
tor.—*Hardware Dealers' Magazine.*

TURNEY HEADPHONES!

3000 Ohms—\$6.50 List

FOR

\$4.50 each CASH or
DEPOSIT with
ORDER

In Lots of 12—10% discount

Shipment from Stock

Atlas Radio Co.

141 W. 42d St., N. Y.

No Aerial

No Loop

No Lamp Socket Attachment

ONLY—

RADIO-DUCT

—AND A GROUND CONNECTION

Sold in 10-Foot Rolls

At \$1.00 per Roll

IF YOUR DEALER HAS NOT
GOT IT WE WILL SHIP
DIRECT UPON RECEIPT OF
YOUR REMITTANCE.

Columbia Electric Motor Co.

1414 ADAMS STREET

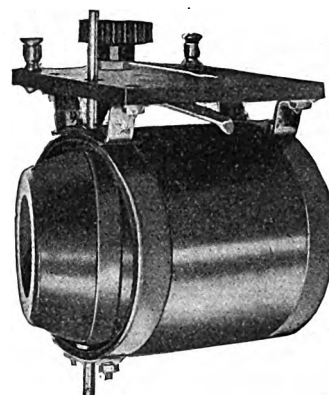
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NEW JERSEY

Telephone: 3731 Hoboken



Radio Products of Depend-
ability Are Always Good
Sellers—Try Them



ILLUSTRATING OUR

**"Every-Wire-Contact"
Coupler****LIST PRICE \$7.50**Write for descriptive circular and
dealers' prices.**MORELAND SALES CORP.**

30 OGDEN ST.

Newark

New Jersey

Subscribe for RADIO WORLD. \$6.00 a
year, \$3.00 six months, \$1.50 three months.

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RADIO WORLD'S QUICK-ACTION CLASSIFIED ADS

This department is intended for everybody who wants quick action on short announcements covering the buying, selling, exchanging or general merchandising in the radio field. Readers of RADIO WORLD will find that it pays to read these columns every week. Advertisers will get a ten-day service here—that is, copy received for this department will appear in RADIO WORLD on the news-stands ten days after copy reaching us.

The rate for this RADIO WORLD QUICK ACTION CLASSIFIED AD. DEPT. is 5c. per word (minimum of 10 words, including address), 10% discount for 4 consecutive insertions, 15% for 13 consecutive insertions (3 months). Changes will be made in standing classified ads., if copy is received at this office before 4 P. M. on any second Tuesday preceding date of publication. RADIO WORLD CO., 1493 Broadway, N. Y. C. (Phone, Bryant 4794.)

Exchange jolly interesting letters through our Club! Stamp appreciated. Betty Lee, 4254 Broadway, New York City.

Manufacturers of Rogers Radio Receivers and Rogers Receiving Radiometers. Rogers Radio Company, 5133 Woodworth Street, Pittsburgh, Pa.

High Grade Antenna Wire. Best quality 7 strand No. 22, tinned copper, non-corrosive antenna wire. Only 1c. per foot. The Kehler Radio Laboratories, Dept. W., Abilene, Kans.

Crystal Set That Gets Radio Concerts. Build it right, boys. Plans and full instructions for building at low cost, high grade fine adjustable Crystal Receiving Set, fifty cents postpaid. Dept. R. D., Shaw Mfg. Co., Galesburg, Kans.

RADIO CABINETS—With all good tone chambers, with or without phonograph combination. Any quantity in stock sizes or in order. Columbia Mantel Co., 175 Powers Street, Brooklyn, N. Y. Tel. Stagg 2726.

WRITE for catalog showing complete line of Elenco Shielded Radio Apparatus, tuners, detectors, amplifiers, transformers and sockets. Electric Machine Corporation, Indianapolis, Indiana.

AGENTS WANTED in every city and town to sell standard radio apparatus. Attractive discounts given. If interested, write at once, stating age and radio experience. Wilmington Electrical Specialty Co., Inc., 912 Orange Street, Wilmington, Delaware.

TYPE R-3 MAGNAVOX TYPE R-2
We can make immediate delivery on a limited supply of Type R-3 Magnavox, \$45.00, 14" Horn, and Type R-2, 18" Horn, \$85.00. Dealers and agents, discount 10% on 1, 15% on 2 or more. C. O. D. or cash with order. THE KEHLER RADIO LABORATORIES, Abilene, Kansas, Dept. W.

DEALERS and JOBBERS
Write for our attractive proposition. Shipments and satisfaction—not disappointments. Service unexcelled. Complete line. G. S. NYCUM, Manufacturer NYCO Radio Supplies, 507 Penwood Ave., Wilkinsburg, Pa.

\$1.00 COMBINATIONS—BY MAIL, \$1.49
No. 1—100 ft. No. 14 antenna wire; 20 ft. No. 14 insulated ground wire, 1 ground clamp (solid copper); 1 single pole double throw lightning switch. No. 2—1 8 by 3/4 inch insulated tube, wound with enameled wire; 2 slides and 2 brass rods to fit; 4 nickelplated brass binding posts. No. 3—2 60c. switch-levers (3/4 inch); 20 contact points with nuts; 4 stops, 4 binding posts, 1 detector stand (unmounted). No. 4—1 set of 4 radio tubes, 8 inches long by 3-3/8—4-1/4 dia.; one spool No. 24 cotton covered wire, 375 feet; one wood rotor. Enclose Money Order or Checks, but no stamps. Brillmanton Radio Products, 874 Columbus Ave., at 103rd St., New York.

Men, Over 17, Wanted—Steady work. Commence \$135 month. Government Railway Mail Clerks. Common education. List positions free. Write today. Franklin Institute, Dept. G-151, Rochester, N. Y.

New Westinghouse Senior, complete, regular \$75.00 at \$60.00; less antenna, \$50.00. Murdock phones, new, \$4.25. Write for other specials. D. G. Fox 20 Fernwood Ave., Haverhill, Mass.

Six Different Samples of Radio-frequency loop aerial sets for sale. Made up amongst others for the Radio Guild's line and not adopted because of slight panel design error. Radio Guild, 256 W. 34th St., New York City.

Amateurs, Attention! A. P. Detector Tube, \$5.00. DeForest Socket, \$1.00. 23 plate .0005 Moulded Top V. C., \$4.00. Arkay Horn, \$5.00. Central Radio Co., Valley Falls, Kansas.

FOR SALE—New VACTUPHONE. Recent invention by Earl C. Hanson for those of sub-normal hearing. Will sell at 33 1/3 per cent. discount. Address J. W. Demler, 121 Sherman Ave., New York City.

SELL 1/2 K. W. Packard Transformer mounted, with four power taps, 13,200-V secondary, for 110-V 60 cycle, \$20. Quenched gap, 1/2 K. W., \$10; OT bakelite mounted, \$5. Shortwave regenerative, V. T. controls on same panel, \$20. Or, trade for 500-V motor-generator, or cw set (need not work), with tubes. Apparatus guaranteed. Port Arthur Radio Laboratory, S-H Dept., Port Arthur, Tex.

MOULDED V. T. sockets of standard type and good quality given free with each detector tube purchased at \$5. Sockets guaranteed and only 50c. each. Order now to avoid delay. An introduction to our service. Port Arthur Radio Laboratory, Port Arthur, Tex.

SELL OR TRADE—Westinghouse RC, for Grebe CR9, RADIO, 8 South Ohio Ave., Atlantic City, N. J.

IS YOUR HOOK-UP RIGHT?
Fifty complete vacuum tube hook-ups, both transmitting and receiving, thoroughly illustrated and described. Only best circuits used. Send 50c. today. Westboard Radio Engineers, 309 Canal Street, New York City.

FOR SALE—Complete crystal set, \$12.50. Audiotron, two filaments, \$5.50. Langley, 34 Shores St., Taunton, Mass.

FOR SALE QUICK—6-60 storage battery, fully charged, \$12.00; 5-dial omnigraph, \$15.00; "NAA" receiving transformer, \$6.00; 3-foot eagle kite, \$1.50. All nearly new. Sell separately or all four for \$30.00. Albert Brown, R. 4, Greenwich, N. Y.

100-24,000 Meter Regenerative Tuner for \$80.00. Prepaid Zone One. Write for particulars. Robert Brown, Box 176, New Brunswick, N. J.

CONCERTS—Loud and clear during summer. One drop of "CRYSTALITE" does it. Makes Crystal extremely sensitive. Year's supply by mail, \$1.50. Valuable booklet free, "RADIO KINKS AND HOW TO ELIMINATE STATIC." Radio Mail Order Supply Service, 900 Chestnut St., Philadelphia.

RADIO MAN—Ten years' technical and practical experience, studied latest developments, expert phone transmitters and latest type receivers, wants permanent connection. Go anywhere. Write. Evans, SORS, 80 Washington St., New York City.

No. 5 Omnigraph, complete, with fifteen dials, \$15.00. Leroy Nice, Souderton, Pa.

My Regenerative Receiver and two-step amplifier for sale. Set was made to order. Workmanship and performance unsurpassed. Price, without batteries or tubes, \$75.00. First check takes it. Receiver guaranteed. C. H. Glick, 5 Sheridan Square, New York City.

30% Discount on Standard Radio Sets and Parts to everyone. New material only. Bargain price list of everything Radio, 25c. Refund on first order. Immediate deliveries. Radio Instrument Co., York, Pa.

SPECIALS—Kellogg Phones, \$9.00. Murdock No. 56 3,000-ohm Phone, \$5.50. A \$1.00 "Radio Director" free with Radiotron Amp. Tube, \$6.50. C. CHAMBERLAIN, Berea, Ohio.

BUILD YOUR OWN Electrolytic Storage Battery Charger. Plates and Complete Instructions, \$1.00. Descriptive Circular Free. PEERLESS ELECTRICAL PARTS CO., 105 Harris Street, Rochester, N. Y.

CHOICE CRYSTALS FOR YOUR RADIO SETS
The Bay City Assay Office, 209 West Holly, Bellingham, Wash., offers Argental Galena Crystals, in pairs, at 25c., 35c., and 50c. Sizes suited to capacity of your receiving set. Every piece has sensitive spots and fully guaranteed.

VARIABLE CONDENSERS—23 Aluminum Plate, \$3 kind, \$1.65; 43 Plate, \$4 kind, \$2.25. WAGNER NOVELTY CO., Dept. R, Delphos, O.

Subscribe direct or through your news dealer. \$6.00 a year, \$3.00 six months, \$1.50 three months. Radio World, 1493 Broadway, N. Y. C.

Old Orator Quails When Speaking by Radio

J. H. TREGOE, secretary-treasurer of the National Association of Credit Men, travels throughout the country, addressing audiences of financial executives. His usual subject is economics or credits, and he talks to audiences of any size with equanimity. Yet the experience of addressing by radio those invisible thousands whose instruments were tuned to pick up the WJZ waves was an ordeal for this experienced speaker. In commenting upon it, he said to a representative of *The Evening Telegram*, New York:

"The novice in public speaking finds it difficult to control his knees or to keep his ideas from evaporating into space when appearing before his first audience. If at all sympathetic, the audience will steady the speaker, give him confidence, raise his courage and annihilate his fears. "But in this case I could see no audience. I placed myself in the hands of the young man in charge of the proceedings. He indicated a low straw chair which was so comfortable that for a moment I forgot my embarrassment. He then ad-

justed the cone so that it hung in front of my face and leaning over said in deliberate tones, 'Station WJZ, Mr. J. H. Tregoe, secretary-treasurer of the National Association of Credit Men will now address the radio audience. We introduce Mr. J. H. Tregoe.'

"My time had come! Instead of a ripple of polite applause I was struck by a wave of silence. Instead of several hundred business men fixing their eyes upon me, I saw only framed photographs and a large vase of flowers.

"Try it yourself. Step up to a broadcasting machine and essay to speak to an unseen audience. First comes a trickle of fear, followed by a sensation of coldness, with a climax reached in a deep seated impression that you are making a big fool of yourself. A three minutes' address in such a situation seems like an eternity and would take the nerve out of the best trained man when he tries it for the first time. Imagination goes careening everywhere. When trying to look composed and speak coherently, you are wondering all the time what people are hearing you, and if perhaps some friend will not say, 'I know that fellow.'"

BACK NUMBERS AND NEW RADIO WORLD READERS!

The publisher has reserved a limited supply of the first fourteen issues of RADIO WORLD for the benefit of new readers who want to become subscribers and have their files complete from the first issue. The first fourteen copies will be mailed postpaid on receipt of \$1.80; or better still, subscribe now for six months (\$3.00), or twelve months (\$6.00 for 52 issues) and have your subscription start with No. 1. Radio World Co., 1493 Broadway, New York City.

First Radio Written Music Is Sung on New York Stage

RUDOLPH FRIML, the composer, sailed from New York City for Europe on June 17, on the steamer "Majestic." Florenz Ziegfeld, Jr., producer of "The Follies," also was a passenger. While at sea, Mr. Friml wrote a fox-trot number and dedicated it to Miss Mary Eaton of the cast of "The Follies." The music was sent by radio from mid-ocean. This is the first record of a radioed song being wafted from a steamer on the briny deep and, a few hours later, sung from a stage. Following is the code by which Mr. Samuel F. Kingston, Mr. Ziegfeld's manager, received the score:

3 NYU 60 RADIO COUNTED
SS MAJESTIC VIA LUISBURG
JUNE 21, 1922

KINGSTON
NEWAMSTERDAM THEATRE
NEWYORKCITY....
FIRST SONG COMPOSITION TRANS-
MITTED BY MARCONIGRAM SONG
ESPECIALLY COMPOSED BY
RUDOLPH FRIML ABOARD THE
MAJESTIC FOR F ZIEGFELD TO
SUNG ZIEGFELD FOLLIES MIREDO
REMISOL LADORE DOLADO SIZOLSI
LASOLMI SOLFASOL MIREDO
REMISOL LADOMI RESHARP SI
DOSHARP SI DOSHARP SI
SOLSHARP LASILA SOLSHARP
FASHARP SILASIRE DOSOLMI
RESHARPMISILA SOLSHARP
LADOLA FAMI SIDOSOL MIREDO
REMISOL LADORE DOREMI
REDOLA SOLMIDO

FRIML.

Beginning with the word "miredo"—a telegraphic condensation of the three musical terms, "me," "re," and "do," it is not a difficult matter to follow Mr. Friml's melody. In fact, you can try it on your own piano. It was not difficult to transcribe the words in the radiogram to a sheet of music paper, and engage a skilled musician to make the orchestration. Mr. Friml had taken the words of the song with him, and a duplicate copy was in New York.

Why Radio Is Clearer at Night

IT is a fact often observed that it is possible to work radio communication over much greater distances at night than in the daytime. This may be explained by the effect of the sun upon the air, which causes ionization of it, and is most active in the daytime, and practically absent at night. The sun seems to be responsible without question, in view of the fact that very erratic results in long distance receptions are always noticed at sunrise and sunset.—A. F. Van Dyck, R.E., G.E., in *The Tribune*, New York.

Mr. Hoover's Radio Power

THE consensus of the authority which Congress may vest in Herbert R. Hoover, Secretary of Commerce, may be summed up as follows:

1. Classification of licensed stations and operators along with official registration with the Government.
2. Authority to prescribe the nature of services various stations may render.
3. Power to assign wave lengths and determine locations.
4. Control of kinds of instruments or apparatus with respect to "outside effects."
5. Regulation of times and methods of operating.

WE ARE SOLE DISTRIBUTORS FOR

The "ALL-WAVE" COUPLER

150 TO 3,000 METERS

GUARANTEED WAVE LENGTH

A combination vario-coupler, and loading coil. Incorporates a superior process of combination flat and bank winding on one compact unit. Permits building the most compact receiver at a low price, as it eliminates Variometers, Vario-Couplers and Loading Coils. The Biggest Seller You Can Stock, at

\$15.00 List

The RADIO PHONOLIER

combines Lamp, and complete Radio Receiver, one step Radio, Detector, Tuner, two steps Audio, and Loud Speaker.

The "All-Wave" coupler, plus the Radio Stores Condenser, gives the Radio Phonolier a range of from 150 to 3,000 meters.

The Radio Phonolier is built of solid copper, and finished in Bronze, Silver or Gold, with lamp shades to match or contrast with interior decorations.

List Price, \$300 And Up
Without Tubes and Batteries

IMMEDIATE SHIPMENTS

RADIO STORES CORPORATION

Dept. W, 222 WEST 34th STREET, NEW YORK



SHOWN
OPEN—
Is a
Perfect
Table
Lamp
When
Closed.

Charles E. Hayes Co.

Wholesale Distributors of

Radio and Electrical Supplies

32-34 TAYLOR STREET

SPRINGFIELD

MASS.

MASS.

Telephone: River 3515

KEYSTONE VARIABLE CONDENSERS

21 Plate
\$3.55

43 Plate
\$4.50

Our selection of materials and built-up type design give assurance of low energy loss and high efficiency.

Agents and Jobbers write for information

KEYSTONE MOTOR COMPANY

OAKS, MONTG. CO., PA.

RADIO WORLD, 1493 Broadway, New York City

Our supply of back numbers of RADIO WORLD (Nos. 1 to 14) is limited. We will take orders for the first fourteen issues until the supply is exhausted. If you want these numbers, or want your subscription to start with any special number, let us know.

RADIO WORLD CO., 1493 Broadway, New York City

"VOX HUMANA"

"THE RECEIVER WITH THE LIVING VOICE"



Patents Pending

Price Complete **\$400.**

WRITE FOR CATALOG

The Radio Guild Vox Humana, model A, is for use in the home. Nothing has been spared to make it the most perfect and refined instrument on the market. Sombre and quiet in appearance, there is nothing freakish or sensational in its design or construction.

Everything necessary for reception of music, concerts, etc., is contained in the cabinet. There are no outside connections. The music and voice are reproduced in pure and natural tones. There is no hissing, howling, or crackling noise in this model—disagreeable sounds produced by static, and interference from Radio Telegraph stations, common to receivers which require an outside antenna, are also eliminated.

The Vox Humana, model B, is similar in design and appearance to model A except that means are provided for much greater amplification. This model is therefore particularly adapted for use in Hotels, Restaurants, Theatres and other public places, where large volume is necessary.

Armstrong's Super Regenerative Receiver

How to Construct and Operate It.

Complete with Diagrams and Photographs.

By

KENNETH HARKNESS

PRICE, 35c.

Special Price in Quantities

PUBLISHED BY RADIO GUILD, INC.

256 West 34th Street

New York City

SPECIAL PROPOSITION TO DEALERS AND DISTRIBUTORS

Our line of receivers, each the acme of perfection in its class, priced from **\$35.00** up, now ready for distribution.

Our Type A 201 VACUUM TUBE TUNER and DETECTOR, Complete with Phones, Antenna, Lightning Arrester, etc., sells for **\$35.00**.

Our Type A 211, Complete, as above, with all wave range—150 to 3,000 meters, **\$45.00**.

The Radio Guild, Inc.

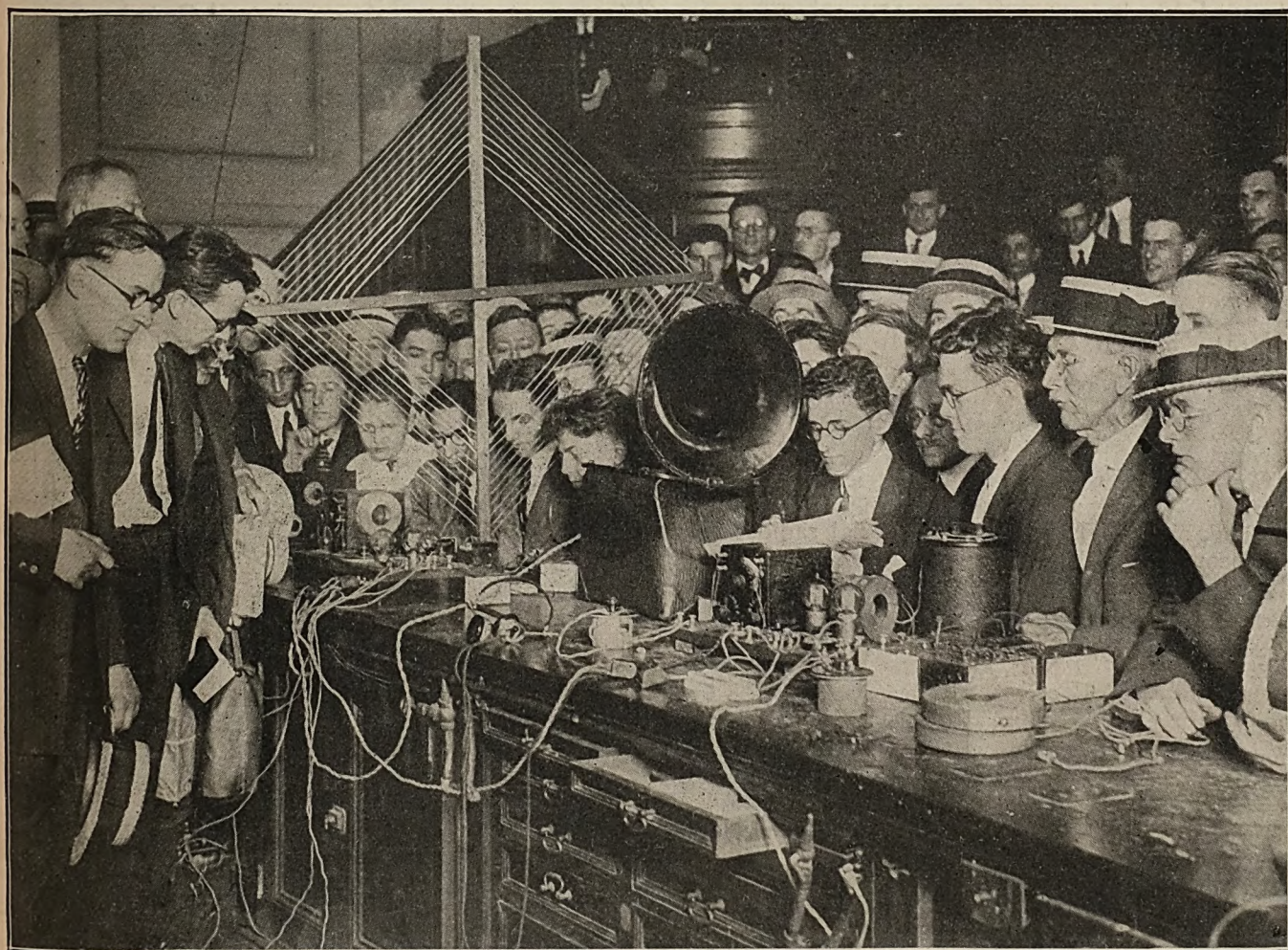
256 WEST THIRTY-FOURTH STREET
NEW YORK CITY

RADIO WORLD

Entered as second-class matter, March 28, 1922, at the post office at New York, New York, under the act of March 3, 1879

I L L U S T R A T E D

Enthusiastic Fans Examine Armstrong's New Receiver



(C. Kadel & Herbert News Photos)

It was like election night at Columbia University, New York, on the night of Wednesday, May 31, when Major Edwin H. Armstrong explained every part of his new superregenerator. The photograph indicates the long, tedious work of putting the receiver in operation. Major Armstrong used a loop aerial exclusively for the reception of signals.

How to Assemble a Detector and 2-Stage Amplifier

See
Page 6

BUY "RITE"

Klosner Rheostats	\$1.00
U. V. 200 Detectors	\$4.50
U. V. 201 Amplifiers	\$5.90
4-Inch Electrode Dial	\$1.25
Radiocite Tested Crystals—	
“Rite” Detector Unit	\$5.50
“Rite” Amplifier Unit	\$11.95
Ducons (No aerial)	\$1.50

Postage Paid.

Wholesale and Retail.
Dealers—Write for Discounts.

Specialty Service Co.

Corner 4th Avenue and Pacific Street
BROOKLYN, N. Y.

Variometers Ready for Wiring

\$1.65 PER SET

2 Mahogany Stators, 1 1/4" x 1 1/4", Mahogany Rotor,
3 1/4" x 3 1/4", Winding form and all necessary brass
Hardware.
Best Outfit, Obtainable Radio Dept. Cash or Money Order

ARROW WIRE COMPANY

557 West 35th Street N. Y. City, N. Y.

Latest broadcasting map 15c. That is, a complete broadcasting map appeared in Radio World, No. 8, dated May 20. Mailed on receipt of 15c. Radio World Company, 1493 Broadway, N. Y. C.

Changing Inductance

THERE are various methods of changing the inductance in a circuit. A straight wire has very little inductance. Make a coil of the same wire and the inductance is greatly increased. The coil can be made either by winding it smooth over a form, such as a broomstick, or by winding it spirally in the same plane. This is the same way in which electrician's tape is rolled. The inductance of a coil is changed by changing the number of turns of the coil in the circuit.

To Figure Capacity

ONE method of changing capacity in a circuit is to change the number of condensers in a circuit. A second method is to change the capacity of a single condenser. This is done by having two sets of plates that make a condenser movable in connection to each other. When every part of the plates in one set is opposite plates in other, capacity is greatest.

JULY INVENTORY SALE

YOU Cannot Miss These Fall Values at

SUMMER PRICES

Variable Condensers

43 Plate

Were \$4.50 Now \$2.25

Were \$4.75 Now \$2.75

25 Plate

Were \$4.00 Now \$2.25

Variometers

Were \$7.00 Now \$5.00

Were \$5.00 Now \$3.00

Mahogany

Were \$6.00 Now \$3.60

Variocouplers

Were \$6.00 Now \$3.60

Others

Were \$6.00 Now \$3.00

Loose Couplers

Were \$8.50 Now \$5.50

Wound Coils

800 Meters

Were \$1.00 Now 60c.

Were 75c. Now 45c.

Rotary Switches

Were 75c. Now 25c.

Were 50c. Now 20c.

Were 45c. Now 15c.

Bakelite or Nickel Binding Posts

Were 12c. Now 6c.

V. T. Sockets

Were 75c. Now 45c.

Were 60c. Now 36c.

Phonograph Attachments

Were \$3.00 Now \$1.80

Adapts Any Make Phonograph to a Loud-Speaker.

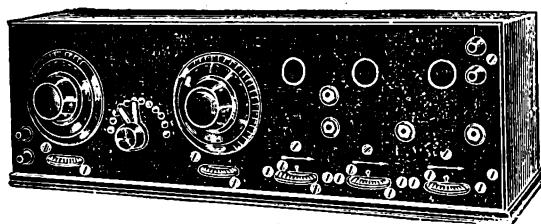
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Beacon Radio & Elec. Co.
246 Greenwich Street
New York City

PROGRESS SURROUNDS RADIO TO-DAY

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ACHIEVEMENT

Progress Is Co-operation!

You Have An Opportunity to Become a Co-operator in the

NORRIS RADIO CORPORATION

which, since 1913, under the name of the Norris Electric Specialties Co., has produced standard electrical equipment and radio apparatus. We are now expanding in radio to enable us to produce standard equipment, and our special radio patents (one of which appears in our advertisement on page 25 of this issue). We number among our customers the following:

U. S. Government
Western Electric
General Electric
Westinghouse
New York Telephone & Telegraph
American Telephone & Telegraph
Chicago Edison
Sao Paulo Tramway Light & Power Co., Brazil
Kellogg Switchboard & Supply Co.
Domestic Heating & Lighting Co., Galesburg, Ill.
Third Avenue Railway Co.
Northwestern Electric Equipment Co.

U. S. Navy
Interborough Rapid Transit Co.
Brooklyn Rapid Transit Co.
New York Edison Co.
Pennsylvania Railroad
New York Central
Western Union
Postal Telegraph
Radio Supply Co., of California
W. C. Teas Co., Chattanooga, Tenn.
Reliance Electric Co., Norfolk, Va.
Electric Appliance Co., Chicago
Commercial Electric Supply Co., St. Louis

To NORRIS RADIO CORPORATION,
126 Liberty Street, New York City, N. Y.
I would appreciate information on Norris Co-operative plans.

Name
Address
City State
Occupation

For a limited period, we offer investors participation in our plans for expansion.

Radio enthusiasts who know radio as it is and will be, communicate with our secretary.

RADIO WORLD

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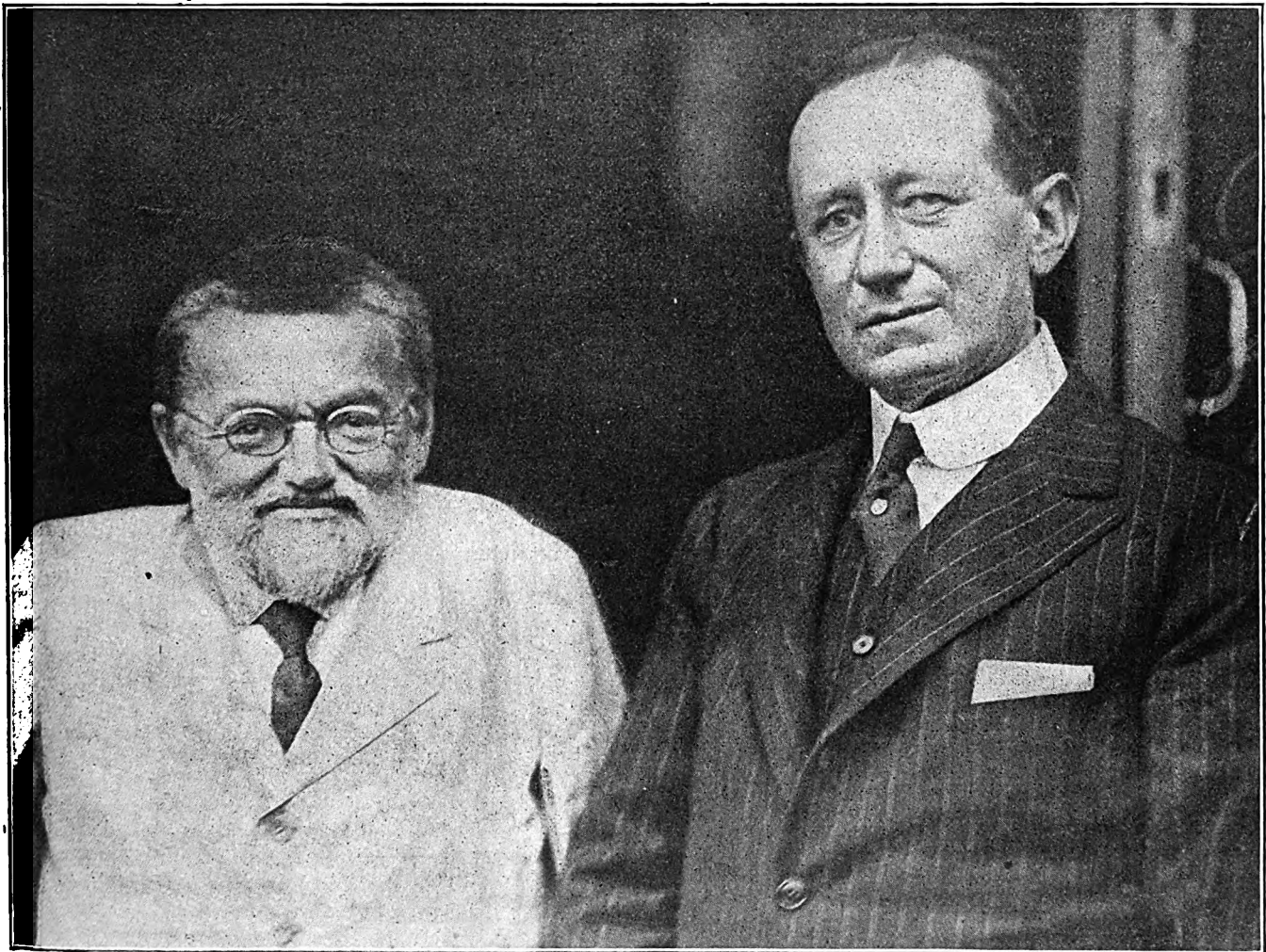
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Vol. 1, No. 16

July 15, 1922

15c. per copy, \$6.00 a year

Two of the World's Giant Radioists, Steinmetz and Marconi



(C. Underwood & Underwood, N. Y.)

On the left is Charles P. Steinmetz, chief electrical engineer of the General Electric Company, Schenectady, New York; on the right Senatore Guglielmo Marconi, inventor of wireless telegraphy. These two giants in the world of radio were photographed on the steps of the G. E. Company shortly after Mr. Marconi's arrival there. Here is a photograph the readers of "Radio World" should preserve. Here are the likenesses of two men whose names will be handed into posterity as radio workers who toiled with theories until they produced results

IN the demonstration of his super-regenerative system before the Radio Club of America, Major E. H. Armstrong said:

"What I have just shown you is a system that gives the same results with three tubes as you obtain with nine tubes in the super-heterodyne principle. Now the super-heterodyne is the Rolls Royce of radio, and while there are people who ride in Rolls Royces, there are

The Ford of Radio

quite a number who have to ride in Fords. I'm now going to show you the Ford of Radio."

He made a few rapid changes in the apparatus before him, and then succeeded in filling the room with music from Newark (eighteen miles away) upon a loud speaker, with only one vacuum tube, attached to a three foot loop aerial.

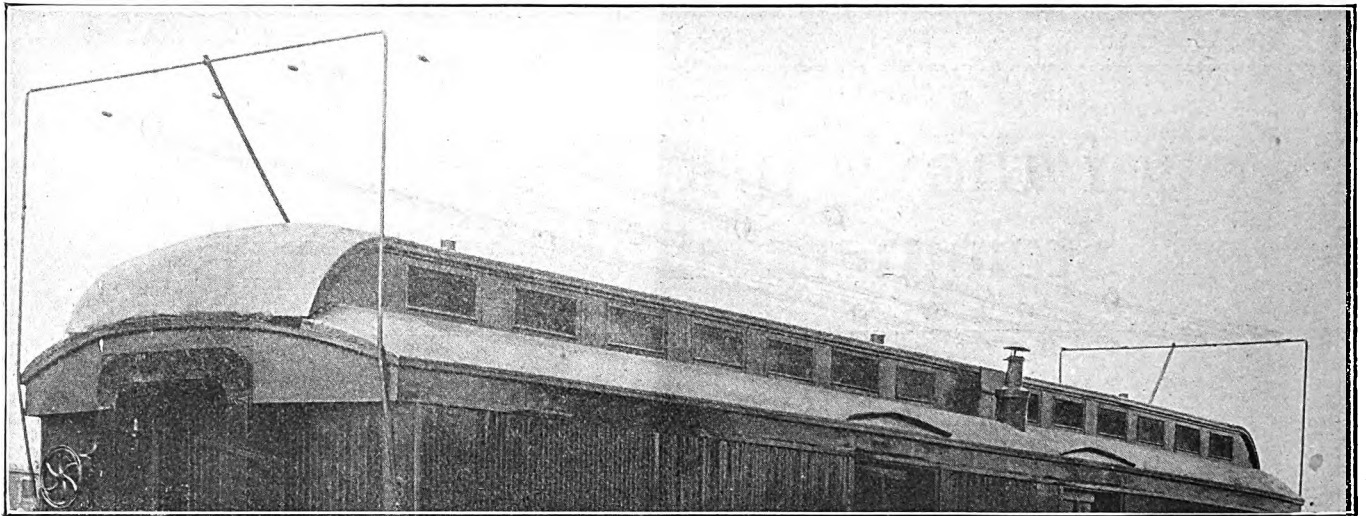
The audience was completely carried away with the astounding results and cheered madly.

In his latest adaptation Major Armstrong has succeeded in making one vacuum tube function as a regenerator, oscillator and detector simultaneously, giving amplification never dreamed of.

"There are other possibilities with the super-regenerative system," said Major Armstrong.

Fast Frisco Train Makes Radio Record

By Robert M. Reed, Radio editor, "Daily Oklahoman"



Exterior of car showing antenna equipment devised by Earl Hull, of the Oklahoma Radio Shop. It comprised four 4-wire cage antennas.

THE *Daily Oklahoman*, cooperating with the St. Louis and San Francisco Railroad, the Oklahoma Radio shop and the United States Government station at Post Field, Oklahoma, has accomplished a feat yet to be equalled by any other radio broadcasting station or railroad—the feat of receiving and transmitting messages on a fast-moving train, at a

distance greater than twenty-five miles from the broadcasting station.

Equipped with a regenerative receiving-set with four stages of amplification, a loud speaker, a 100-watt transmitter, and a novel antenna, consisting of four, 4-wire cage antenna strung from one end of the baggage car to the other, the car was attached to 'Frisco train No. 9 at Oklahoma City, on the

morning of May 30, and hauled to Lawton, Oklahoma, a distance of 100 miles.

At Mustang, Oklahoma, thirty miles from Oklahoma City, a severe electrical storm was encountered, but signals were received and very little static.

Constant communication was kept up between Oklahoma City (WKY) and Post Field (DM6) and the telephone conversations were heard with great clearness.

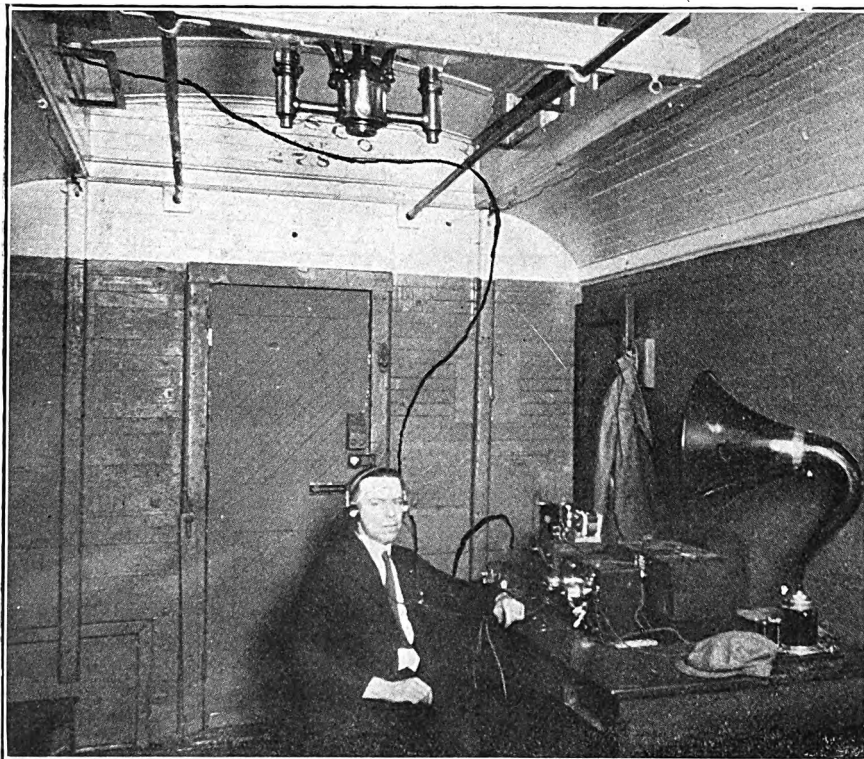
At Cement, Oklahoma, sixty miles from Oklahoma City, and forty miles from Post Field, the signals, music, weather reports, Liberty Bond quotations, etc., were received with as much clearness as they were at Wheatland, Oklahoma, only sixteen miles from Oklahoma City.

With a thousand reasons why the apparatus should not have worked and only a very few why it should, the entire run of a hundred miles marks an epoch in the use of radio on moving trains.

On May 31, the same trip was made with the car over the same stretch of track and proved to be even more successful than the run of May 30.

Favorable weather conditions, together with various changes made in the apparatus, contributed to the success of the trip on May 31; and the world record for receiving and transmitting by radio on a moving train was maintained.

The most remarkable thing about the tests made on the Frisco is that they were received for more than ninety miles from a broadcasting station with only a 20-watt set, while the Lackawanna in an earlier test used a 100-watt set and received only from twenty-five miles distance from the broadcast-



H. S. Richards, radio operator, at the complete regenerative receiving-outfit, with loud-speaker, in the specially equipped car of the S. L. and S. F. R. R. The car used was of the ordinary baggage type. Such a car makes an excellent reception room, because it eliminates a large percentage of sound. The officials of the Frisco system are taking up radio in earnest.

Assembling a Detector and Two-Stage Amplifier

By H. S. Stanford

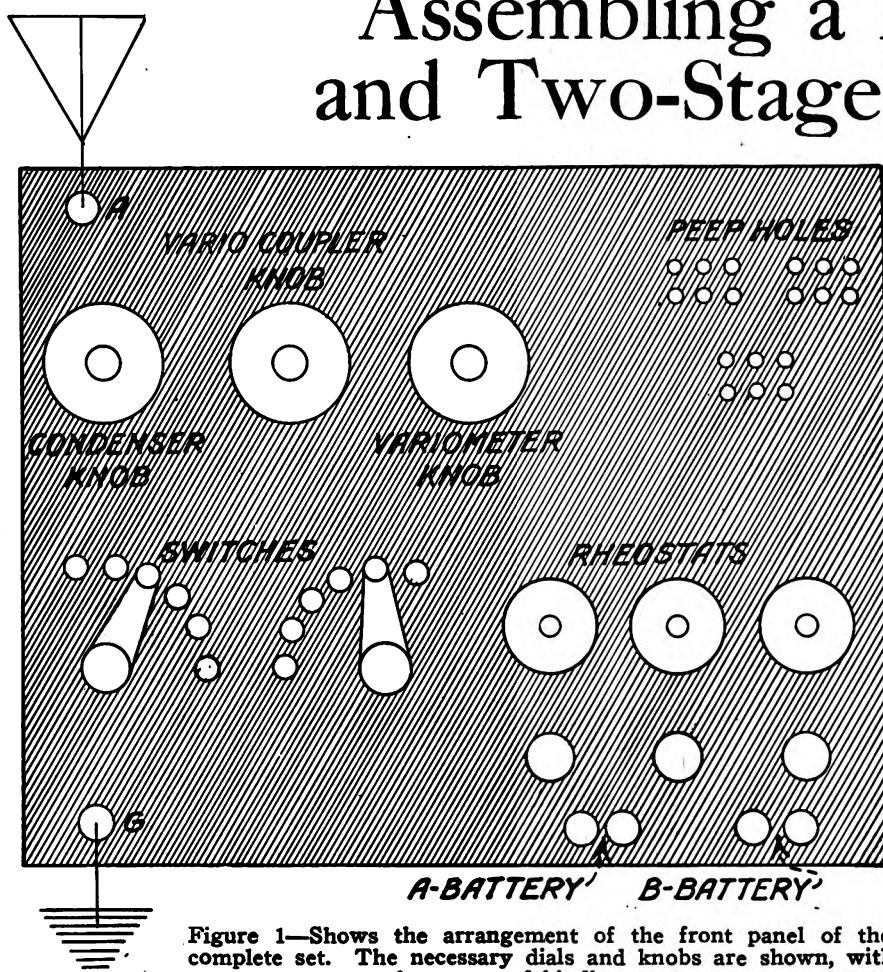


Figure 1—Shows the arrangement of the front panel of the complete set. The necessary dials and knobs are shown, with rheostats and binding posts.

Suggested by H. S. Stanford. Drawn by S. Newman.

A SERVICEABLE schematic diagram, or circuit, fully describing the construction of a vacuum-tube receiver with two steps of amplification should be valued by the amateur. Anyone who wishes result-producing sharp-tuning should use the variometer type of receiver with a vario-coupler. All necessary parts for such an outfit may be purchased within the limits of the ordinary pocketbook. When assembled they will give satisfaction.

In such a set there are two distinct circuits, namely, the aerial, or primary, and the secondary, or closed, circuit. The following are required for building:

- 1 variocoupler.
- 1 grid condenser, and leak.
- 1 .001mfd., variable condenser.
- 1 .0005mfd., variable condenser.
- 3 tube sockets.
- 3 knobs for control on panel.
- 1 detector tube. (Be certain this is a detector tube.)
- 2 amplifying tubes.
- 3 rheostats. (Vernier type if they can be secured.)
- 2 amplifying audio-frequency transformers.
- 1 variometer.
- 1 6-volt A battery.
- 1 45-volt B battery.
- 1 pair head-phones.
- 3 jacks.
- 1 fixed, or by-pass, condenser.
- 1 cabinet.

1 piece bakelite panel, 18 by 10 inches $\frac{1}{4}$ inch thick.

Necessary screws and binding posts.

Before starting to wire, the apparatus should be carefully inspected in order to ascertain if the parts are correct. I suggest that simple laboratory connections be made previous to the final layout and that each part be wired up to its respective connection. This is of great importance. The time to find errors is when testing out with the laboratory connections and not after the set is under way; for late testing be

will tend to break down the set and injure the workmanship. No stupendous result may be expected at first; for it must be realized that the loose wiring and connections afford too many capacity defects and leakage.

There are several ways in which these sets may be built, namely: unit receiver, unit detector, unit detector and amplifier, and a combined set including receiver, detector and two-stage amplifier in one cabinet.

I wish to bring strongly to the mind of the novice that the set herein described is an assembled set—one that may be considered inexpensive. Not only will the builder save money, but the experience derived from building such a set will enable him to know what radio really is. Furthermore, should any trouble arise, the builder, knowing his set, may easily remedy the trouble. This regenerative set has a variometer in the plate circuit for regeneration and increases the strength of signals, making it possible to receive weak signals from long distances.

The circuit shown is, probably, the most extensively used receiver to-day. It lends itself to a very simple and easy method of adjustment. The antenna, or primary circuit, has a variable condenser in series with the antenna, and is tuned by a switch-arm which moves over the contact points varying the number of turns of inductance in the open circuit. The variometer in the plate circuit acts as a valve in which regeneration takes place. The panel should be made of bakelite. The necessary material should be mounted on the panel. Necessary holes should be drilled after the parts have been

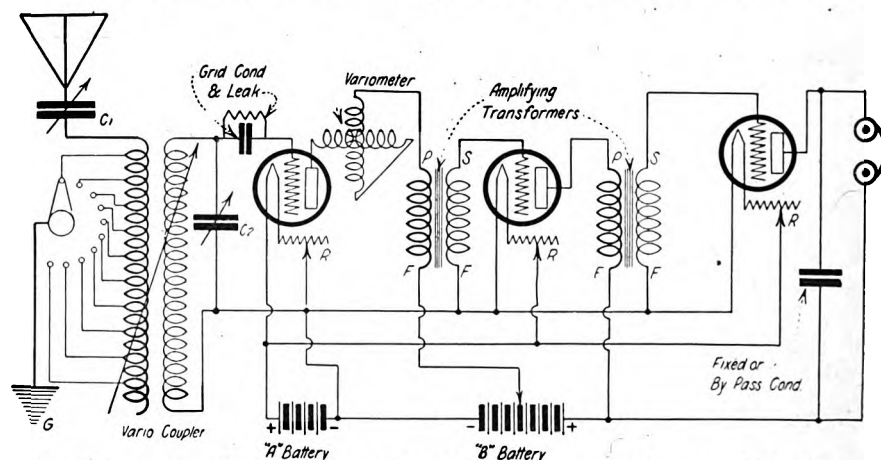


Figure 2—Schematic diagram of the wiring of the complete set. The diagram shows every part and element that is needed for the set. Suggested by H. S. Stanford. Drawn by S. Newman.

Nine Months of Broadcasting

By Carl Hawes Butman

THE Department of Commerce on June 30, licensed the 382d, broadcasting station, issuing 21 during the week. Within nine months, all these broadcasting stations were created until to-day, the air is literally charged with information and entertainment. The future of radiotelephonic broadcasting seems assured, as the remarkable growth still goes on at the rate of about three new stations each day.

Since the advent of broadcasting, only ten stations have dropped out, and most of those on account of the termination or transfer of a business or due to the death of the owner. Among the recent stations *deleted* are the following:

KGC—Electric Lighting Supply Co., Hollywood, Calif.

KQL—A. A. Kluge, Los Angeles, Calif.

WGH—Light & Water Power Co., Montgomery, Ala.

WPB—Newspaper Printing Co., Pittsburgh, Pa.

WQB—C. D. Tuska, Hartford, Conn.

KOJ—University of Nebraska.

Among the news stations listed this week is the first department of the American Legion to take up broadcast-

ing, the Nebraska Department of this organization having been assigned the call WGAT, the last three letters of which seem to have a special military significance and recall a weapon with which most veterans were familiar not so long ago.

A newspaper in Fort Smith, and one in South Bend, have put in broadcasting stations, making nearly fifty dailies with private stations; while three more universities have opened stations.

The following are new stations:

WGJ—W. H. Gass, Shenandoah, Iowa.

WGL—Lancaster Electric Supply & Cont. Co., Lancaster, Pa.

WGAN—Cecil E. Lloyd, Pensacola, Fla.

WGAH—New Haven Elect. Co., New Haven, Conn.

WGM—Orangeburg Radio Equipment Co., Orangeburg, S. C.

WGAT—American Legion, Department of Nebraska, Lincoln, Neb.

WGAU—Marcus G. Lumb, Wooster, Ohio.

WGAQ—W. G. Patterson, Shreveport, La.

WGAS—Ray-di-co Organization, Chicago, Ill.

WGAR—Southern American, Fort Smith, Ga.

WHAA—State University of Iowa, Iowa City, Ia.

WHAB—Clark W. Thompson, Galveston, Texas.

WGAZ—South Bend Tribune, Inc. Madison, Wis.

WGAW—Northwestern Radio Co., Milwaukee, Wis.

WHAD—Marquette University, Milwaukee, Wis.

WHAE—Automotive Elec. Service Co., Sioux City, Ia.

WHAC—Cole Brothers Elec. Co., Waterloo, Ia.

WHAJ—Radio Elec. Co., Pittsburgh, Pa.

WGAU—Ernest C. Albright, Philadelphia, Pa.

WGAV—B. H. Radio Co., Savannah, Ga.

Her Radio Set Is a Match Box



(C. Underwood & Underwood, N. Y.)

This, it is claimed, is the smallest radio receiver to make its appearance. It is the size of an ordinary match-box. It has already been adopted by the fair sex as being the most convenient radio receiving set, and a number of young ladies have made it part of their apparel to "listen in" during rest hours.

(Continued from preceding page)

laid out. Generally, when manufacturers are making sets, their first-control handle is usually the variable condenser. Next control is the variocoupler, and last control is the variometer. This means that there are three knobs on the front panel. First control is at the left.

Under the second handle, or knob, space is usually allowed for the knob that controls the taps of the primary. This indicates that the three knobs are to be laid out and marked just prior to the drilling. This concludes the tuning devices.

Next, the jacks and rheostats. The rheostats are mounted evenly in a row so the handle on the rheostat may turn freely under each one.

A jack is mounted in a vertical line with the handle. When this has been accomplished, the same procedure is followed with the other two jacks. When the jacks are wired up they will be, respectively, first-jack detector, second-jack detector and one step, last-jack detector and two steps. A few small holes are drilled in the panel over each rheostat, as shown in the schematic diagram so the brilliancy of the tube may be seen. At the same time it acts as a ventilator that the heat generated by the tubes, when in operation, may escape.

Arrange the layout of the apparatus, as shown in the schematic diagram, for the front-panel control. Note the position of the binding posts. Only six binding posts are needed, mounted as the diagram shows. This completes the full set so far as parts are concerned.

All that remains is the wiring. Usually the amplifying transformers are mounted on a small piece of bakelite and screwed to the back of panel above the jacks so that they are at right angles to main panel. Mount transformers so they rest at right angles to each other. This is necessary, as much of the induction, including tube noises and howling, will be eliminated. Wire up the set according to the schematic diagram.

Using solid-copper wire for wiring purposes is all right, but a number of fans are too inexperienced to handle this material. If other wire is used, place it in a tubing better known as spaghetti tubing. This makes a neat job and prevents short circuits with other wires. When finishing up the set, the builder may decide whether he wants a cabinet or not. If he does, it could be purchased easily at a nominal cost.

With the aerial, ground, necessary tubes, A battery and B battery, the set should be mounted up and tested.

Medical Advice to Be Sent Free By Radio to Travelers on High Seas

By J. D. Smith

CAPTAIN ROBERT HUNTINGTON, of the naval and marine engineering school of the Seamen's Church Institute, New York, in cooperation with the United States Public Health Service, has announced that free medical advice will be available through coastal radio-stations of the Radio Corporation of America, on the Atlantic and Pacific Coasts. On the Pacific, arrangements have been made, through the San Francisco station, to give immediate advice from physicians and surgeons of the United States' Marine Hospital or the United States' Veterans' Hospital. Ships on the Pacific, desiring medical advice, may secure prompt service by calling San Francisco. All that is required is that the symptoms of the person afflicted shall be reported. The medical advice will be phrased in simple English, intelligible to any layman. This service, of course, is primarily for the benefit of ships which carry no physician but may also be available for consultation between ships' physicians and those ashore.

The surgeons aboard the Canadian

Pacific ships have reported many instances in which medical advice has been sent to other ships by radio which has done much to save life. One or two of these cases demonstrate the value of this service. An apprentice aboard the "Cairngowan" fell into the ship's hold while the vessel was on its way from England to Montreal. He was so badly injured that a general message was flashed to all ships that might have a doctor. The first response was from the Canadian Pacific liner "Empress of France." The doctor of this vessel gave advice by radio regarding treatment and medicines to be given. The "Empress of France," however, was rapidly steaming in the opposite direction and was soon out of touch with the "Cairngowan." The surgeon aboard the Canadian Pacific "Sicilian" was next communicated with and the wireless was kept busy continuously flashing messages with the necessary advice for the treatment of the injured man.

Last month, the steamer "Metagama," during one Atlantic trip, was asked by three ships for medical advice. "It was the most remarkable voyage I ever had," said Dr. E. W. Drury, the ship's doctor, on arrival in port. "We had wireless messages asking for medical advice from the steamers "Canadian Raider," the "Dunbridge," and the "Agadir." Although the "Metagama" was more than 200 miles away from these ships five messages were received and five dispatched to each of them. On the "Canadian Raider" the chief engineer was suffering with kidney disease; on the "Dunbridge," a man had his hand badly crushed; and a fireman aboard the "Agadir" had met with a serious accident. Our last reports showed that the patients were rapidly progressing—and were extremely grateful—thanks to the medical advice sent by us."

Because of the success in treating patients at sea by radio, medical service similar to that in use on steamers flying the United States flag, will be put in operation by the Canadian Government.

Radio Students Work with Will



(C. Keystone View Co.)

There is very little idleness in a radio class and absolutely no funk. There is a reason: The young man who is about to go into radio as his life's calling, realizes that he has a big future before him; for radio—according to the best prognostications of the most consistent experts—will soon become one of the biggest industries in the country. Photograph of a Los Angeles school.

Facts for Beginners

TO prevent corrosion where splices are made in mending aerials and to reduce the resistance to the lowest value by insuring good contact, all joints should be soldered. In receiving, the resistance due to corrosion of the wires at the joints tends to weaken the strength of the signals.

* * *

Many beginners are still puzzled as to what the aerial does. It radiates energy in the form of electrostatic waves in order to absorb part of the energy radiated from a distance.

* * *

The magnetizing force of any current-carrying coil depends on the number of ampere turns. To get the loudest response in a telephone from very weak signals, it is necessary to use many hundred turns of wire, and due to the limited space very small insulated wire must be used. The smaller the wire the greater the resistance. This accounts for the fact that all sensitive telephones are very high resistance—1,500 to 2,000 ohms.

* * *

The action and work of radio depend on two types of radio waves, one known as "damped waves," the other as "undamped waves." In radiotelephony, radiotelegraphy, both are used.

Combined Radio- and Audio-Frequency Amplification

By C. White

RECENTLY there has been much discussion concerning the relative advantages of radio-frequency amplification over that of audio-frequency. Radio-frequency has the marked advantage of amplifying the wave desired and not static, while audio-frequency amplifies all that is audible to the ear. Furthermore, since the first tube in the audio-system is the detector, a soft or gaseous tube, there is amplified, in addition to static, quite a good deal of hissing and tube noises. This last limits, very definitely, the number of tubes that can be used in such a system; but, with radio-frequency, owing to the fact that the detector is the last tube, tube noises play a very minor part.

The actual volume of sound we can get from the detector is limited; hence, even though a sound be fully detected and audible through ordinary headphones, audio amplification is fully necessary to further increase the actual audible volume. It is well for the amateur to bear in mind that radio-frequency *can not* be used to amplify signals that already come in with good volume without such augmentation; therefore, for this reason alone, audio-frequency can not be completely and satisfactorily dispensed with in all cases.

The average amateur is limited in most cases in regard to the actual size of his equipment by the high cost and maintenance of vacuum tubes. I believe that if vacuum tubes could be purchased at a price commensurate with that of the ordinary incandescent lamp, many, no doubt, would be in possession of eight or, perhaps, twelve tube sets. Thanks to the fact the vacuum-tube basic patent-rights will soon run out; and, perhaps, before many years have passed this market condition will be a reality, provided the demand does not drop. But, at present, and until such a condition is slowly brought about, we must exercise economy in every way with our tube equipment.

The French, during the World War, made the discovery that many people were not using their tubes to the best advantage; for instance, one tube was used to perform one function only, and no more. On the faces of those more experienced in the art of wired telegraphy and telephony, a smile would immediately dawn if we talked of using one wire or pair of wires for performing one function only. Many amateurs, no doubt, are fully aware of the fact that more than one message may be sent over a pair of wires at the same

time by means of the so-called system of multiplex telegraphy. Why then should we not use our tubes to perform several functions at once; viz: to amplify radio- and audio-frequency waves at the same time. Although this was done successfully by the French many times during the war, still comparatively few American amateurs have made use of it.

The scheme, in theory, is very simple. The incoming wave is brought into the primary of the radio-frequency transformer (Figure 1), while the secondary circuit consists of the secondary of an audio-frequency transformer shunted with a condenser, about the size of the ordinary phone-condenser, connected to the grid and filament respectively. The plate circuit consists of the plate, phones and B battery, both shunted by a small phone condenser, the terminals of the receiving or detecting circuit, and back to the filament. Of course, the circuit illustrated shows a one-step combined radio- and audio-frequency amplifier; but as many as eight stages of combined amplification have been successfully employed. The theory is that the high radio-frequency waves pass through to the radio-transformer secondary circuit, where they will pass through the condenser shunting the audio-transformer secondary, since the impedance of the latter to the high-frequency waves is extremely high compared to that of the condenser. The tube will magnify the oscillations in the grid circuit and pass them on to the plate

circuit where, again, the high-frequency waves will prefer to go through the phone condenser and into the receiving or detecting apparatus where they will be rectified by the detector tube. After rectification, the audio waves are passed through the primary of the audio-transformer to the same tube again for audio amplification. But in the plate circuit, the audio-frequency waves will pass through the phones, thus causing the audible signal. Naturally the receiving system must be tuned to the frequency of the incoming wave. This is best accomplished by tuning approximately with detector alone, then using the amplifier.

To those of you who have already worked with radio-frequency amplification it is practically useless for me to say that one can not be too fussy in carrying out the details of the actual hook-up. Therefore still more pains must be taken in constructing a combined amplifier. Since the tube is performing a double function, the utmost care must be taken to insure perfect operation. Sometimes considerable experimenting is necessary to determine the size of the bridging condensers for the audio transformer and the phones; but for the average case .001 microfarads will suffice. I have a friend who is using two stages of combined amplification with a crystal detector and receives better results with the crystal detector than he did with a tube detector using a regenerative circuit. In conclusion, I wish to say to the amateur who tries this: remember that it is and has been proved practicable, and that too much care can not be exercised in the selection of good apparatus.

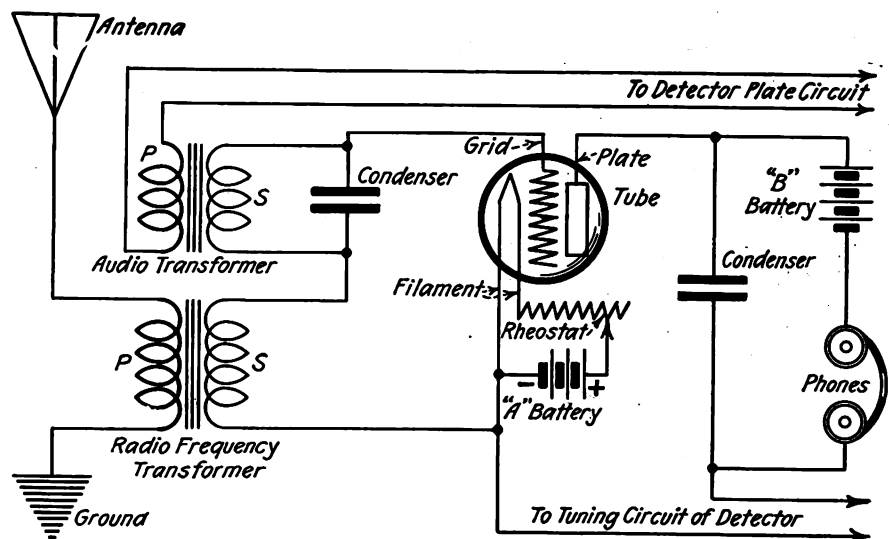


Figure 1—A one-step combined radio- and audio-frequency amplifier; but eight stages of combined amplification have been employed. Drawn by S. Newman.

The Radio Primer

The beginner who follows regularly this department in RADIO WORLD will secure a liberal education in the applied principles of radio science

The Beginner's Catechism

By Edward Linwood

WILL four dry-cells connected in series give me sufficient voltage for lighting of a vacuum tube? Is this as good as a storage battery?

Four dry-cells connected in series would give you ample voltage for filament-tube lighting; but as they are series connected the amperage, or life, of the 4 cells would be that of 1 or 25 amperes. This means that if 3 tubes were in actual use, and 1 ampere being used per hour, per tube, the 4 cells would last, approximately, 8 hours or less. With the storage cell the ampere life runs from 40 to 100 amperes, meaning that, with the required 6 volts and 3 tubes, the life would be the difference of 15 hours for the 40-ampere battery, and 35 hours with the 100-ampere battery. The big advantage of the storage is that it can be recharged at a nominal cost; whereas, with the dry cells, new ones would have to replace the old.

* * *

What is meant by the normal rate of discharge of a storage cell?

This means the number of amperes which may be drawn from the cell without injury to the plates. This varies with the different make of cells. The value of discharge may be found by dividing the capacity in ampere hours by the hour-rating of the cells. Usually cells are rated on a 5-hour or 8-hour basis.

* * *

What care should be given a lead cell or storage battery?

The electrolyte should be kept $\frac{1}{2}$ -inch above the tops of the plates at all times. The cell or battery should be kept clean; free from dust and dirt that may collect on the tops. The cell should not be permitted to remain idle for any length of time without being charged. Keep the voltage well up over 1.8 volt per cell. Do not overcharge, undercharge, or overdischarge. While charging keep flames away from cell or battery.

* * *

What is sulphating and how is it caused? What is buckling?

The lead cell is the only battery that

has this so-called sulphation. It is nearly white in color, resembling snow, and forms on the surface of the plates. It is due to permitting the battery to stand idle too long on discharge. Sometimes from overcharging. Buckling is the warping of plates. Too much warping causes one plate to touch another. This means that a short circuit takes place and kills the battery. It is caused from overheating of the plates and also drawing too much current from the battery at one time.

* * *

Suppose the electrolyte in cell or battery falls below the level of the tops of the plates what should be done?

Chemically pure water should be used in covering the plates. Simply use a funnel and pour in water until plates are covered. Distilled water is usually used by storage-battery makers.

* * *

How may one determine if a battery was charged? What tests will indicate that the battery was charged or discharged?

The voltmeter and hydrometer are two means in which this can be determined. The voltmeter reading should show over 1.8 volts per cell. If the meter should show less, place battery on charge. If the hydrometer should show on its scale a reading under 1.200, place battery on charge. Using the hydrometer, get the battery well charged so the hydrometer shows a reading of 1.275 or over.

* * *

What precautions should be taken when placing a battery on charge?

Open vent caps on battery. See that plates are well covered with electrolyte. See that the correct polarities on the charging source of supply are correctly connected to the battery cells. See that resistances are in circuit. Never allow a battery to get too hot while charging. If a battery gets too hot while charging, disconnect service supply and allow the battery to cool. When the battery has cooled off, resume charging.

Radio World's Revised Radio Dictionary

By Fred. Chas. Ehlert

Farad—The unit of capacity. When a condenser of such dimensions will hold one coulomb of electricity if a pressure of one volt is applied, it is said that such a condenser has a capacity of one farad.

Fading signals—Signals, the strength of which slowly diminishes at the transmitting stations through power which is not varied. Generally this is due to atmospheric conditions.

Field rheostat—A variable resistance employed to regulate the power or flow of current into the field windings of a motor or motor-generator.

Filament—A thread made of carbon or tungsten which, when heated acts as a negative charge in a vacuum tube. It allows the passage of electrons.

Fixed condenser—An apparatus or condenser for collecting and storing up electrical energy.

Frequency—The term employed that expresses the number of cycles per second. We speak of a 60-cycle current as one having sixty complete reversals per second, or a frequency of 60 cycles.

Flat-top aerial—One whose suspended wires are stretched parallel to the earth.

Flux—In a given space are the magnetic lines of force. The total amount of these lines of force is called Flux.

Flux density—The total number of lines of force per square inch. Either electrostatic or electromagnetic lines of force.

Fundamental wave-length—The wave length of the ground and aerial alone without the addition of any condensers of coils in the circuit.

Field—A region or space traversed by lines of force.

Field winding—The winding of the field magnet of a dynamo or motor.

Galvanometer—An instrument, or apparatus, for measuring the intensity of an electric current as well as detecting its presence and direction, usually by the deflection of a magnetic needle. Varieties of galvanometers, are the aperiodic, or dead beat, astatic; ballistic; differential; marine; sine; tangent, and reflecting.

Galvanoscope—An instrument, or apparatus—as a magnetic needle used for detecting the presence and direction of electrical currents especially those of feeble intensity.

Gaskets—Insulating discs used to separate the discharge gaps of a quenched gap.

Grid—A perforated metal frame assembled in a tube in such a manner that it is placed between the filament and plate of a tube. The grid is insulated from the filament and plate of the tube.

Grid leak—Merely a strip of paper on which a pencil line is drawn which makes a very high resistance connected around the grid condenser. For the purpose of stopping the howling or squealing noises in head phones. It is of a very high resistance.

"Don't Scrap Your Sets!" — Armstrong

By Joseph Turner

BEFORE a throng of radio amateurs and radio engineers, Major Edwin H. Armstrong, for the second time, gave a demonstration of his superregenerative receiver, at Columbia University, New York. He advised all who are inspired and enthusiastic over early reports of his sensational demonstration not to scrap their present equipment.

With all that is claimed for the superregenerative receiver, it is still in a state of development, and is more for the engineer or technical expert than the amateur. It requires technical skill, as well as unlimited patience to understand it fully. With the proper adjustments yet to be made, the novice may find it easy to operate.

Major Armstrong's advice to radio amateurs should be heeded, and no attempt made to construct his new set as

results may *not* be obtainable. Even radio experts who have tuned hundreds of radio circuits claim that the tuning elements are too technical, at the present time, to be fully understood by the average radio novice.

There is no question as to what the superregenerative receiver will accomplish. The mystery of the whole circuit rests in the correct values for the various pieces of apparatus. It is most essential that coils of the right size be used, with the correct values of capacity, along with the proper voltages of plate and grid circuits.

Major Armstrong has released all of his information regarding his receiver. RADIO WORLD published the circuit fully in its issue of July 8.

Amateurs who have the experimental urge, will lose nothing by setting up an experimental or laboratory

circuit. In fact, it will do them a great deal of good by giving them the experience together with some new information on the circuit. Some difficulty may be experienced, at first, in getting the set tuned; but, after hours of patience and proper adjustments of the controls, some results may be obtained.

Loop aeriels have been used exclusively by Major Armstrong. They have the marked advantage of being directional. Of course, his receiver does not respond to long-distance reception. The superheterodyne is still superior for long-distance work.

Amateurs should hear what Major Armstrong says and should not scrap their present equipment in order to get in on this new receiver. Stick to what you have for the present.

That is Major Armstrong's advice!

Locating Your Aerial

By Harold Day

WITH the best of conditions, the aerial can be run from one end of a house to a tree; or to another house, inside as well as outside. The outside aerial, however, is best. The ability for reception is affective on the height, meaning that the higher the aerial the greater the signal strength received. Remember that anything metal in a house that may be grounded and may interfere with the action of signals, probably reducing the strength. Water pipes, radiators and telephone wires come under this head. Never connect a radio ground to the telephone ground as you will have trouble. Use a good ground and keep your aerial free and clear.

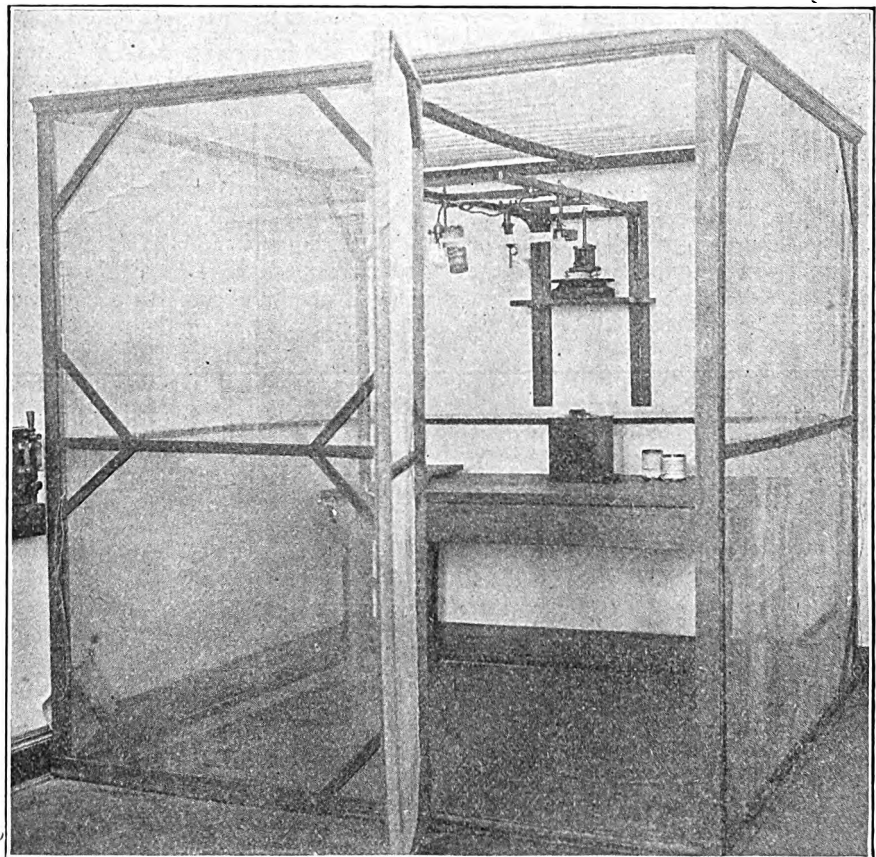
Will Other Colleges Follow Suit?

Registration for the summer radio session at Hunter College, New York, will far exceed that of previous years, Professor A. Busse, Director, has announced. The session opened July 5, with 65 instructors and more than 200 courses. Among the courses this year will be one on elementary radio theory.

Radio on French Schooners

A cable from France is to the effect that radio equipment ranging from 250 watts to 1,000 watts, is to be installed on more than 200 French fishing schooners. In 1918 there were only thirty fishing boats thus equipped. — Scientific American.

Radio Waves Cannot Enter Screened Room



(C. Underwood & Underwood, N. Y.)

In the laboratory where precision measurements are made, it is often necessary to provide a space which is entirely immune from radio waves. Radio waves cannot penetrate, or enter, a thoroughly screened room such as is shown in the photograph, and sensitive instruments, therefore, will not be affected by interfering disturbances. Every first-class radio laboratory is equipped with such a room. All compass stations are equipped with shielded, or screened, rooms, which may include windows and doors. When a compass station is calibrated, all doors and windows are closed during calibration. If left open, this will throw out all scale readings, permitting untrue bearings from distant stations.



(Left to right) C. A. Cameron, C. E. Tuck, J. M. Ridley, radio staff of the "Empress of Britain."

Radio Progress on Greyhounds of the Deep

By W. Randall

RADIO service on the Great Lakes, the Gulf of St. Lawrence and on the Atlantic and Pacific Coasts has been second to none in the world is the opinion of many navigators. The Canadian trans-Atlantic wireless service, in competition with the cables, has been in operation some fourteen years with great success. Authorities consider that no series of wireless direction-finding stations have given more help and satisfaction to mariners than those established by the Canadian Government on the Atlantic Coast.

The Canadian Pacific Railway has maintained the recognized standard of efficiency in radio equipment aboard the ships of its fleet. Up-to-date and improved radio installation is carried on

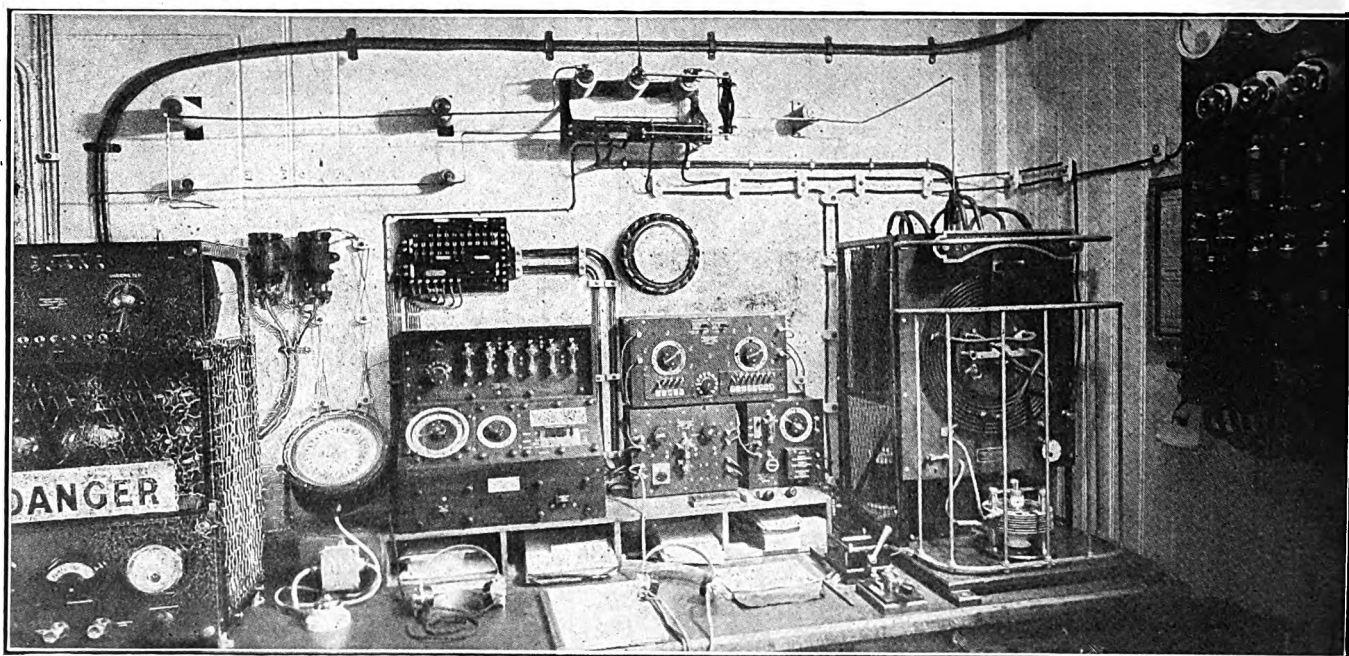
all vessels. A typical radio room, shown in the accompanying photograph, is that aboard the "Empress of Scotland." The installation comprises a $1\frac{1}{2}$ kilowatt quenched gap transmitter, 500 cycle, with normal daylight working range of 500 miles; one quenched gap emergency transmitter, range greater than 100 miles; $1\frac{1}{2}$ kilowatt combination wave-valve transmitter, which has worked a distance of 3,000 miles under favorable conditions; "type 91" 4-electrode valve receiver, "type 127" piano tuner, "type 123" hydrodyne receiver, capable of receiving signals of a wave length up to 30,000 meters, and one direction-finding apparatus, "Type 11a."

The Canadian Pacific is giving much attention to the importance of provid-

ing the latest radio direction-finding equipment on its ships, by means of which the position of a ship can be quickly and accurately determined. The installation of the radio direction-finding equipment on a ship may eliminate serious delays caused by a vessel being unable to enter port during a fog because its position, or the bearing of the lighthouse, is not known. From the earliest days of navigation fog has been the dread and fear of navigators. Storms could be combatted; in fogs, all were powerless. Surrounded by a thick veil, and unable even to see the length of their ships, captains and crews have frequently been faced with the possibility of disaster. Slowly and unconsciously they have drifted towards one another, being ignorant of their relative positions, except for the rough indication given by their powerful fog-horns. Sound, however, is notoriously uncertain and dangerous; for in the fog sounds often appear to come from many different quarters.

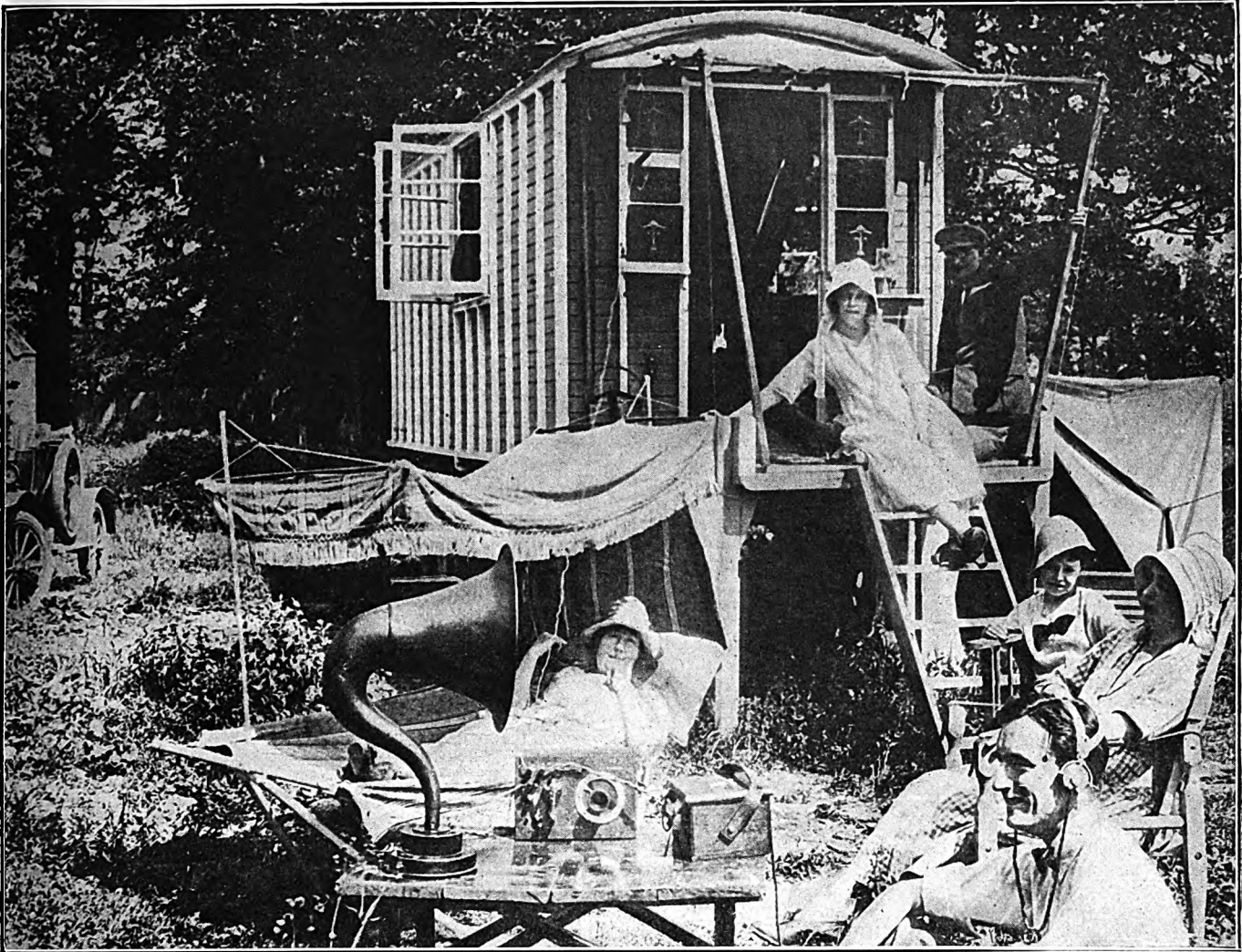
Radio development now promises to remove the remaining elements of uncertainty by means of the Marconi direction finder. By this instrument the great danger of collision at sea can be averted.

The radio equipment on the new Canadian Pacific "Empress of Australia" and "Empress of Canada" contains the latest type of wireless apparatus of the most comprehensive range. They have been equipped by the Marconi Telegraph Company of Canada, Limited. The "Empress of Australia" is now on her first trip from Scotland to Vancouver, via the Panama Canal, and the "Empress of Canada," also on her maiden trip from Hong Kong to Vancouver, arrived at Vancouver June 23.



Radio room on the Canadian Pacific steamer, "Empress of Scotland." The equipment, as fully described in Mr. Randall's article, is up-to-date and of the highest standard of efficiency.

O, Summer's Idle, Sunny, Radio Days!



(C. Underwood & Underwood, N. Y.)

Two things help Major Cleghorn, British war veteran, to an ideal vacation—a "caravan" and a radiophone. With the caravan he can "trek" as far away from civilization as such a thing is possible in England. With the radiophone he can keep in touch with civilization. Just throw the switch and listen in! The amplifier permits him to entertain his guests.

THE simplest outdoor antenna is a single strand suspended across the roof, or between two roofs.

The wire must be at least No. 14 gauge.

A finer wire is suitable from an electrical point of view, but the mechanical limitations must govern the size.

Copper wire should be used in preference to aluminum or iron. Metals which are not used for electrical conduction corrode through action of the elements.

Each end of the wire should be firmly fastened to an insulator, and the insulator suspended by a strong rope.

Single wires give excellent receiving results and are best for the amateur.

Facts About Antennae

But the enthusiast whose space is limited, prefers the multi-wire plan. These are usually the inverted L or the T.

The horizontal part of the inverted L may be made of as many parallel wires as desired.

Such wires should be spaced 2 or 3 feet apart by means of wooden spreader-rods at each end.

Spreader rods may be made by joining several broom handles to get the necessary strength.

Insulators should be placed between the end of each strand and the spreader, and also between the bands fastened to

the spreader and the rope which supports the entire antenna.

Cross wires at each end connect the several strands of the antenna.

The lead-in wire is taken from one end of the antenna. It is preferable to solder it to the juncture of separate wires running to each strand.

The flat-top portion of the inverted L and the T are identical, and the exact difference in either type is in the way in which the lead-in connection is made.

In the L, the lead-in wires are taken from one end; in the T, they are taken from the exact center.

The T type should be used only when the antennas are quite long.

(Continued from preceding page)
These new steamships will be able to make the fullest possible use of the latest developments in radio-engineering as a means of securing additional safety for passengers and crew, as an aid to navigation.

The equipment in question comprises a direction-finder, an "aid-to-naviga-

tion" spark set, a complete emergency equipment and a long-range continuous wave valve transmitter and receiver.

The Canadian Pacific was the first Canadian company to establish a daily all-Canadian news service for its fleet of steamships on the Atlantic and still maintains this exclusive feature for its passengers. This news is made

up daily by the Canadian Pacific, at Montreal, from the latest press dispatches from all over the Dominion and is transmitted to all Canadian Pacific ships on the Atlantic. The Canadian Marconi Company erected a special press station at Louisburg, Nova Scotia, for the purpose of transmitting such news.

Radiograms

Latest Important News of Radio Garnered from the World Over, and Reduced to Short Wave-Lengths for the Busy Reader.

RADIO waves from Queenstown, Ireland, interrupted the judicial calm of the Supreme Court, New York City, Department IX, where Justice Richard P. Lydon was hearing a case. The radio waves should have stopped at Room 426, No. 280 Broadway, opposite the court, but the operator, with the aid of an amplifier, had relayed them through an open window to scatter at will.

* * *

Radiotéléphony may be perfected to extend across the Atlantic. Marconi believes that this is possible within the next few years. At a dinner given to Senatore Marconi, last week, Edward J. Nally, president of the Radio Corporation of America, stated that experiments with the electron tube will advance transatlantic telephony.

* * *

The electron tube is made of glass, and is about two inches in diameter and eighteen inches long. It has been the subject of experiment for twenty years and has been successful in radio work over short distances, according to engineers. It is an amplifier and detector, and even has been mentioned for running motors. When used as a receiver it handles less than one-million part of one horse-power, but is capable of generating twenty horse-power. It makes the wireless telegraph virtually noiseless.

* * *

Radio aided in the apprehension of two alleged lawbreakers within three days. The Metropolitan police sent broadcast a general alarm, to every Europe-bound vessel, to arrest a fugitive stockbroker. He was caught on the "Olympic." A radio flashed from San Gil, Colombia, asked the same authorities to take into custody a young man who had sailed for New York City on the "Barracoa," with \$50,000 that, it is claimed, did not belong to him. Detectives boarded the steamer down the bay and found their man.

* * *

Many who listened in to the radio reports of the recent Leonard-Britton fight took the broadcasting as a matter of course, says a newspaper report. Why not? When one reads about a prize fight, or anything else, in a newspaper, one takes the newspaper as a matter of course.

* * *

Sir Oliver Lodge, Great Britain's veteran scientist is devoting considerable time to radio-research work. He believes, he says, that broadcasting will become one of most important elements in human life. One of his dreams is that the atmosphere may be so electrified that rain may be produced at will.

* * *

The "unmixer box," as it is called, will be utilized, when perfected, to broadcast entertainment that is not free. High-grade entertainment will be radiated from central stations on scrambled waves. Only listeners with unmixer boxes will receive the sounds satisfactorily. "The World," New York, which furnishes this information, states that these boxes will be leased by the year.

* * *

America's feet were firmly planted in the world's radio business when the General Electric Company brought about the organization of the Radio Corporation of America, vested rights in the alternator and other radio patents in it, succeeded in purchasing the British-Marconi Company's interest in the American Marconi Company, and acquired the Tucker-ton high-power station from French interests.

* * *

The John Fritz Medal, for 1922, has been awarded to Senatore Marconi. It is the highest engineering distinction bestowed in the United States. The medal was formally presented to the Italian wizard at a notable gathering of engineers from all parts of the country at the Engineering Societies Building, 29 West 33rd, Street, on July 6. This gathering was in the nature of an international celebration marking the close relation of scientific progress between America and European countries.

* * *

The conversion of twelve 410-foot radio towers—standing like silent sentinels of the sky, in a line three miles long—into one antenna and the synchronization of two giant alternators! This was accomplished last week at the transmission station at Rocky Point, Long Island, N. Y. This is the application of a new summer service. The dual alternators,

which are dynamos, send in conjunction a 400-kw., current capable of plowing its way through any hot-weather atmospheric disturbance.

* * *

Radio may prove a life-saver in mines. The United States Bureau of Mines is experimenting with radio as a means of saving the lives of miners who happen to be caught in disasters. The plan is to have big vehicles equipped with tools and other essentials of rescue work stationed at important points in mining centers. These vehicles are to have radio receiving instruments that they may be dispatched immediately to scenes of disaster.

* * *

The air service of the army is looking for radio operators and can guarantee service to qualified amateurs and operators with commercial experience. Pay runs from \$21 a month for a private up to \$100 a month for non-commissioned officers on a flying status as radio operators. Details may be secured at any recruiting office or by writing to the chief of air service.

* * *

It is not intended that Dr. Irving Langmuir's radiotrons shall immediately take the place of the Alexanderson generators in the high-power transmitting stations, but it is the present intention to link up the tubes with the alternators to make a more powerful station which shall be capable of hurling out stronger signals and, ultimately, to cast the human voice to the far ends of the earth on waves of electric energy.

* * *

Sixty additional 410-foot towers are to be erected at Rocky Point. The plan calling for twelve 6-tower antennae will give it the prestige of the largest station in the world.

* * *

Broadcasting of moving pictures is bound to come, according to Raymond Francis Yates, editor of "The Evening Mail Radio Review," New York. Denes Mihaly, a young Hungarian engineer, has perfected a system for the transmission of photographs. He calls his machine the "telehor." It depends for its operation on selenium, a very peculiar substance. Placed in the dark, selenium offers stubborn resistance to the passage of an electric current; placed in the light, its electrical resistance changes at once and it is transformed into a good conductor.

* * *

A request for a radio fog-signal station on the Nantucket lightship, similar to the stations already established on the Fire Island and Ambrose Channel lightships, has been made by H. H. Raymond, president of the American Steamship Owners' Association, to the Bureau of Lighthouses, Washington, D. C.

* * *

France has only five radio amateurs. Though a progressive country, she is many years behind America in the new science. Too many French laws interfere with radio progress. Too many laws interfere with any progress.

* * *

The first radio fraternity is announced. It is the Alpha Upsilon Lambda, organized by Maxwell S. Jacobi, of the United States Naval Reserve. Howard Wolf, 6308 21st Avenue, Brooklyn, N. Y., is the secretary.

* * *

Seventeen ships of the Hutchinson Steamship Line, Cleveland, are to be equipped with radio. This is said to be the largest single radio job of its kind ever undertaken.

* * *

Amateur wireless telegraph apparatus will be given an important chance to assert itself in the efforts that are being made to relap clear across the continent.

* * *

The Commercial Radio International Committee composed of representatives of the Radio Corporation of America, Compagnie Generale de Telegraphie sans Fil, Gesellschaft fuer Drahtlose Telegraphie and Marconi's Wireless Telegraph Company at its recent meeting in Cannes, France, entered into an agreement for extending international services. Under the agreement a number of new international wireless-telegraph services will be opened in the near future. A considerable development of communication possibilities generally was discussed and agreed upon.

* * *

Mexico City, Mexico, has resumed radio communication with Chile. The powerful Chapultepec station is operating.

Radio and the Woman *By Crystal D. Tector*

CONTRARY to all rumors, I have not had the slightest trouble with my set so far this summer. I'm only an amateur—like thousands of other women—and I've heard a lot about lightning, and static, and thunder, and other atmospheric kick-ups. Up in Westchester County, where I live, we have our quota of all such things; but if they have any effect on radio reception, you cannot prove it by me. I don't imagine that there is another fan who tunes in with greater frequency. And I am seldom disturbed.

* * *

I imagine we all have a lot to learn about radio and its relation to the elements. At first, many of us imagined that it had a lot to do with lightning; now the veriest tyro understands that radio and lightning are as remote from each other as the two poles. "Don't ever let that lightning bugaboo worry you," was one of the first things a very clever radio expert said to me, when I installed my set. "I don't know how such foolishness got abroad."

* * *

I am greatly pleased with the card sent out by Joan Benedict. It is a step forward in broadcasting. It indicates a nice perception of an interesting event. Miss Benedict, who lives in Brooklyn, mailed copies of the following to all whom she anticipated might be interested.

By Radio

JOAN BENEDICT

*Will Broadcast Dr. Van Dyke's
"Ballad of Princeton Battle"*

*Followed by Shakespearean Selections
Station WJZ, Newark, N. J. (360 meters)
Friday, June 30, from 7:30 to 8 p. m.*

LISTEN IN!!

* * *

Miss Ruth Baker, a Pittsburgh stenographer, utilizes radio to increase her speed in shorthand. She records all speeches

that come over the ether. "It's really fun," she declares. "I take shorthand notes while I am listening to the speakers. Then I transcribe my notes for practice. It makes study a pleasure."

Difficulty has been encountered frequently by shorthand students when inducing members of their households to dictate to them. Now instead of coaxing some one to dictate unwillingly, the student finds unlimited practice in the varied supply of radioed eloquence.

* * *

Particularly good were the following stunts by women, which I picked up last week: "Outdoor Sports for Health," by Mrs. Anna Hazleton Delavan; "First Battle of the Revolution," by Mabel R. T. Washburn; "Taking the Work out of Housework," by Mrs. L. C. Reed; "Evening of Surprises," by Dorothy and Ethel Mercer.

* * *

Gossip never appealed to me—and I do believe that every up-to-date woman has too much to occupy her time to waste it listening to idle, meaningless chatter; but I am a journalist as well as a radioist; so you must pardon me if my news-gathering ears corralled the following: As pretty an elopement as ever was planned was called off, down at a Long Island summer resort, last week, because the young lady most interested in the event feared that she and her gallant would be intercepted by radio. "Not on your life with all this radio buzzing through the air," she is reported to have said. "Why we couldn't get to Hoboken before dad's transmitter would be on the job."

* * *

I am told that four young women applied for membership in a Y. M. C. A. radio class in New York recently. They came of their own volition. They said that they were anxious to become experts in the hope of securing some of those five-thousand-dollar-a-year radio positions that are being advertised these days.

Latest Foreign Radio Activities *By Carl H. Butman*

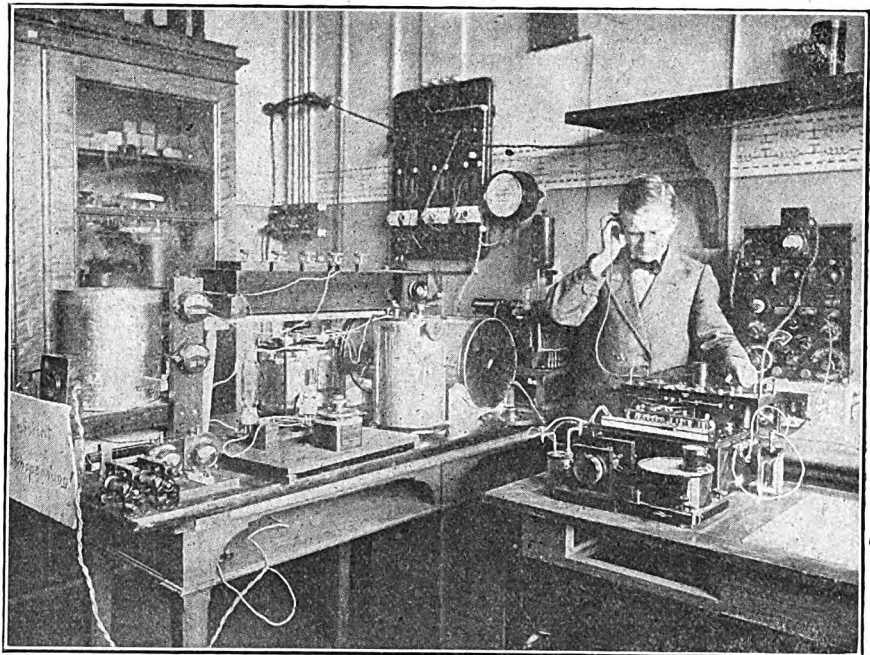
THE Radio Telegraph Direction Service of the Hellenian Royal Navy has practically completed a new 60-kw. radio station at Athens, Greece, to handle official messages. This station, which will be known as SXG, will clear a large number of official messages previously transmitted by Coast Station Athens No. 2, SXB, which is open to general public correspondence. The state of war in Greece has so increased the number of messages as to overburden this station, making it impossible to insure communication for the public. Desiring to improve public radio-communication, especially with ships, the Radio Telegraph Service will open station SXG for official communication, thus permitting SXB to operate exclusively for the public.

* * *

The "Drathlose Uebersee-Verkehr, A. G.," or Overseas Wireless Company of Germany, has attained a new record for wireless service. On March 16, a total of 50,000 words were exchanged, via radio, at the wireless stations of this company at Nauen and Eilvese. Since the reconstruction of commercial relations, the traffic through these wireless stations has been steadily increasing. In August 1919, the entire business for the month amounted to only about 100,000 words. It increased to 550,000 words in June, 1921, and, in February, 1922, rose to 1,000,000 words.

* * *

A radio station has just been established at Kaisariye, Anatolia, from which the first message was sent to Moscow. The Angora Government announced that another radio station would be opened



(C. Wide World Photos.)

A corner in the German government's radio station, Berlin.

at Messina for use in communicating with European capitals.

* * *

Experimental transmissions have begun between Leafeld, England, and Cairo wireless stations. A public service will be inaugurated.

* * *

Denmark is using radio to protect her ships from icebergs. Whenever neces-

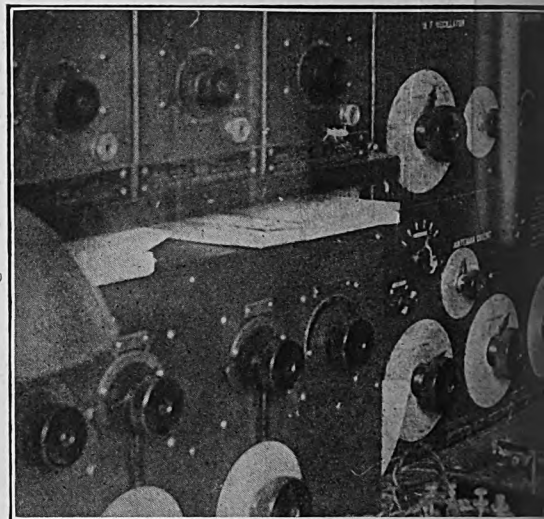
sary, the coast station of Blaazand reports the presence of icebergs in Danish territorial waters at 12.20 and 22.20.

* * *

That England is looking to America for part of her radiophone apparatus and equipment is indicated by recent queries as to sources of supply for radio equipment filed with the United States Department of Commerce.



Radio World's We



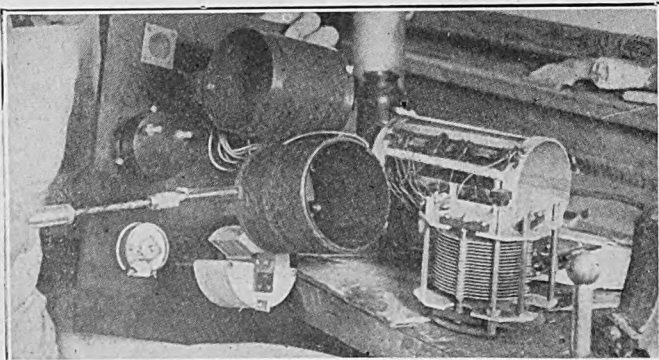
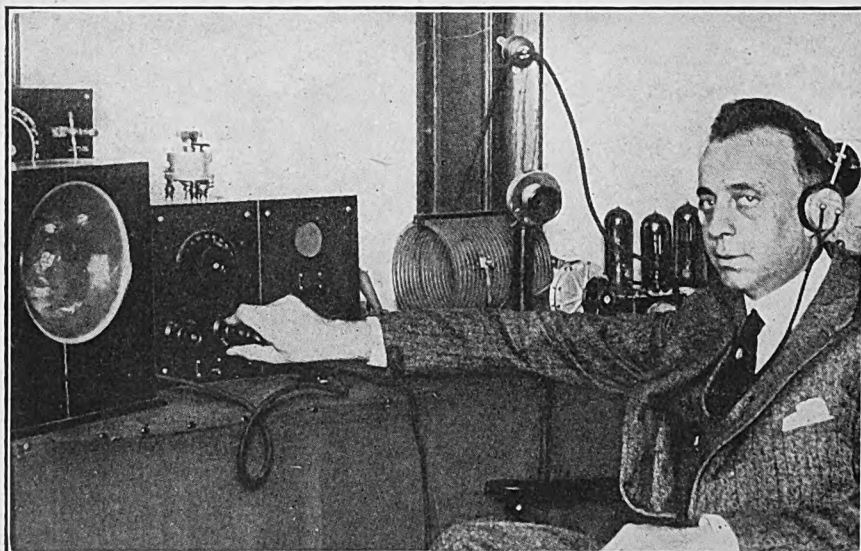
(Left) An exclusive photograph of Cornelius Vanderbilt, Jr., millionaire and newspaperman, taken at the radio set aboard Senatore Marconi's yacht, "Electra." It was Mr. Vanderbilt's first experience with the mysteries of radio.

(C. Underwood & Underwood, N. Y.)

(Right) Harold J. Power, one of the pioneers of broadcasting. He experimented for a year, when a boy, first in his mother's kitchen and later in a shack he called a laboratory. His enthusiasm led to the establishment, in 1921, of the big station operated by the American Radio and Research Corporation at Medford Hillside, Mass. His early broadcasting was accomplished with the crudest instruments.

(Left) Elmer E. Bucher, manager, sales department, Radio Corporation of America. Mr. Bucher is not only a pioneer in the working field of radio, but he has written a number of important radio books.

(C. International News Reel)



(Left) A "close-up" made in a big radio factory. How coils and condensers are fitted to a panel. Radio factories are now giving employment to hundreds of skilled men and women.

(C. Kadel & Herbert News Service)



A mark of railroad progress. This sign is displayed on the "Buffalo Limited" of the Lackawanna Railroad.

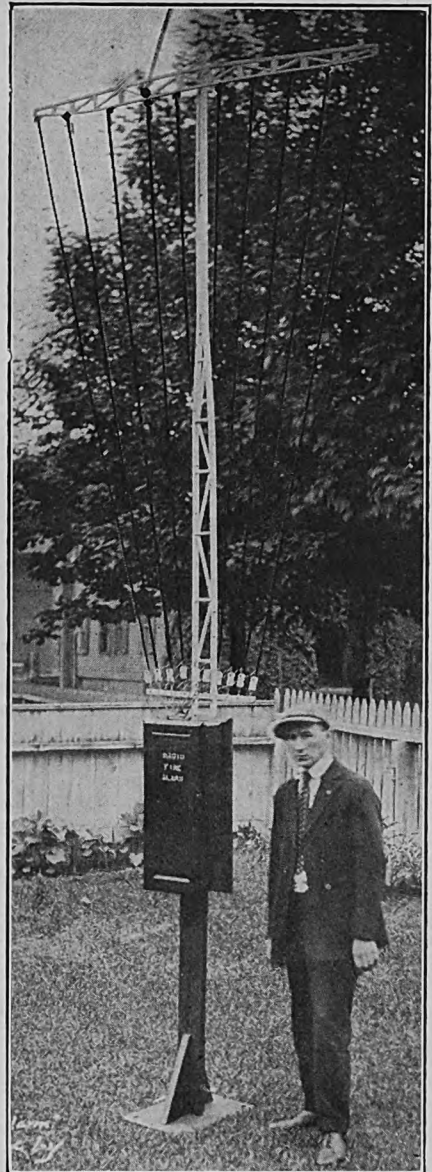
Photographic Broadcast



(Left) This super-hetrodyne set of the Atlantic liner, "America," is what makes long-distance telephoning from far out at sea a success. Conversations were carried on with Government officials in both New York and Washington by means of this set while the "America" was a thousand miles at sea. By duplexing, the operator can talk to a party and another party can talk to the operator at the same time—exactly as with a land telephone. The simplex system can also be used.

(C. Kadel & Herbert News Service)

(Right) A Radio fire alarm invented by Robert Potter, of Springfield, Mass., for which Mr. Potter has applied for patent papers.



(Below) Miss Ann May appears to have solved an old and perplexing problem, "What shall I do to make my vacation a success?" Miss May carries her own radio set with her—even when she is gliding over some lily-strewn lake in her canoe. No longer the moonlight, the "cake eater," the ukelele, or the dulcet guitar! Just rig up a loop antenna in the stern of the canoe and connect with a good set. Let the canoe drift idly o'er the placid waters like a fairy boat—and with the head phones adjusted, listen to w h a t so mysteriously comes through the air from afar. Talk about "Paradise Enow!" Omar Khayyam knew no such entrancing hours in the course of his life.

(C. International News Reel)



(Above) Everything is radio on the Marconi yacht, "Electra." Even the guests dance to music supplied by their personal radio sets. The photograph shows Miss Josephine Young, of Riverside, Conn., and Mr. J. W. Elwood, of New York, on deck, equipped with a portable radio-outfit, dancing to the music of a broadcast fox-trot. This is utilizing radio to the limit.

(C. Underwood & Underwood, N. Y.)



daily, one hour before the
parts from Hoboken, N. J.



Radio Patents

RECENTLY ISSUED

To Increase Antenna Capacity on Warships

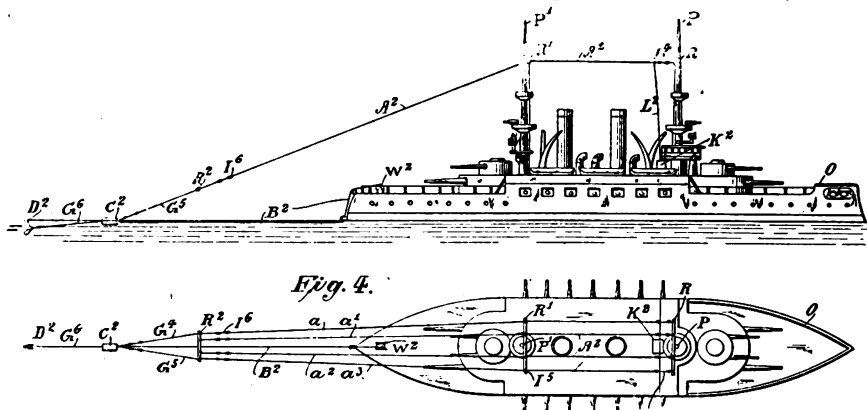
No. 1,420,255. Patented June 20, 1922
 Patentee: John Hays Hammond, Jr., Gloucester, Mass.

MR. HAMMOND appears to have solved a problem that has puzzled naval engineers for some time: How to add to the length of a ship's antennae in order to increase radio reception and transmission. His idea is a longer antenna, one end of which shall be attached to a ship's mast and the other with a "towing anchor"; that is, an "anchor" attached to the ship's stern which is actuated by a propeller. The end of the antenna attached to the towing anchor, is kept out of the water by means of floats.

The towing anchors are preferably in the form of a propeller running on a swivel, which arrangement helps to keep

the propeller near the surface of the water and the towing line and antenna nearly horizontal, when the vessel is under way.

"By this system of disposing my antenna," says Mr. Hammond, "I can secure a far greater length and capacity of antenna than by methods heretofore in use on vessels, and the length of my antenna is not limited by the size of the vessel. The advantages derived from increasing the length and the capacity of an antenna are well known in the art of radio transmission. For instance, the antennae on the biggest battleships, at present, are capable of emitting only about seven kilowatts of power, and the maximum wave length that can be employed with these antennae is only about one thousand, five hundred meters; but with my extended antenna far more power can be emitted and much greater wave lengths employed."



Schematic diagram explaining the invention of John Hays Hammond, Jr., for increasing the antennae of warships.

Answers to Readers

WHAT is an erg? What is a joule?
 —Mabel R. Kenny, Toledo, O.

Erg is from the Greek, meaning "work." In physics it is the unit of work, or energy—being the amount of work done by a dyne (the unit of force in the C. G. S. system of physical units; that is, the force which, acting on a gram for a second, imparts to it the velocity of a centimeter per second) working through a distance of one centimeter. The erg is so small that, as a practical unit, the joule is used.

A joule is a unit of work, or energy, equal to 10.7 ergs. It is equivalent, practically, to the energy expended in one second by an electric current of one ampere in a resistance of one ohm. The unit was named for James P. Joule (pronounced "jowl") the British physicist.

* * *

What is Vernier adjustment?—Thomas Hill, San Antonio, Texas.

Vernier adjustment refers to the small variable condenser placed in parallel with the condenser across the secondary os-

cillating circuit. Its use is to get very minute tuning for continuous wave reception.

* * *

What is a wave length?—Frank Dodge, Philadelphia.

A term used in radio to describe the length of the electromagnetic wave traveling through the ether from a transmitting station. For instance: a wave length of 360 meters means that such a wave measures that length from crest to crest. It is possible, with a transmitting apparatus, to produce waves of any length desired by varying the amount of capacity and inductance.

* * *

What windings should I use for making a grid variometer? What circuit should I use in making a hook-up of two variometers and a vario-coupler?—A. E. Packard, Branch, Ark.

Variometers come unwound. We take it for granted that you are purchasing them and not making them. Simply wind stator and rotor with the same wire. Generally No. 24 single cotton-covered

wire is used. This applies to both variometers. Regarding your circuit, read "How to Assemble a Detector and Two-Stage Receiver," in this issue of RADIO WORLD.

* * *

I have a two-wire aerial, inverted-L type. I desire to make a T-type aerial. Could you inform me if this makes any difference in wave length?—John Bodie, Ingleside, N. Y.

By using a T-type aerial, your wave length will be, approximately, half of the inverted L-type. This means that if the inverted L-type had a natural period of 200 meters, the T-type would be 100 meters. T-type aerials are not directional.

* * *

Could a two-stage amplifier be added to a vacuum-tube set?—John Miller, Syracuse, N. Y.

You may add as many amplifiers as you desire in connection with a tube receiver.

* * *

Is there any advantage in using two crystals?—Hiram Nicolson, Denver, Colo.

Using two crystals will be of no advantage to you with such an arrangement. It will benefit you if you care to have a spare detector in case one gets oiled and dirty.

* * *

What effect will a metal roof have if my aerial is ten feet above it?—Harold Johnson, Omaha, Neb.

If your roof is grounded, the antenna would have only the effective height if the wires are ten feet above the ground. The grounded roof would really bring the ground up to your antenna.

* * *

I have a 43-plate variable condenser and loose coupler. I can hear code signals very well. How can I improve my set so that I may hear WJZ, WWZ, and WHN?—Louis Jaeger, New York City.

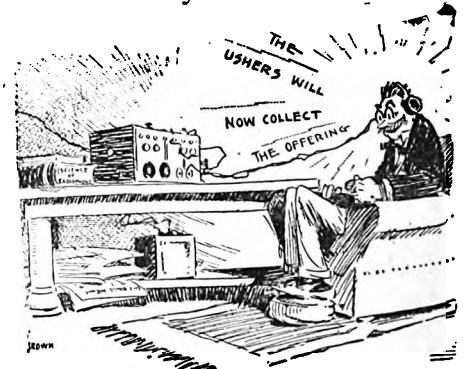
Your diagram is O. K. Use a variable condenser in shunt to the secondary of the loose coupler, or the signals will be very poor. Lengthen your aerial to 100 feet, or increase your aerial to two or four wires. This will improve your set.

* * *

How far can I hear with the following set. One single-slide tuning coil, 8 by 4 inches, crystal detector, and one small telephone-condenser? Will one phone be sufficient? What kind of aerial is best?—Edward Smith, Philadelphia.

You will need two ear-pieces. Their ohmage should be at least a thousand ohms each. Your aerial should be about 100 feet long, tapped at the end and in one line. With the right hook-up, you should be able to receive concerts over a distance of some 15 or 20 miles.

The Radiophone Sermon— Twenty Miles Away.



By Brown, in Chicago "Daily News."

Picking Up a Grocery Order from Mother at Home



(C. Kadel and Herbert News Service.)

Mother is not in the picture, but her dutiful son, Robert Koerner, most certainly is—more dutiful than usual because of radio. Robert's mother told him that he was to bring home some groceries on his way from school. She notified him that at 3:30 o'clock she would call him by radio, so young Mr. Koerner—his radio equipment ever handy—attached a wire to a fire hydrant and heard his mother speaking into a transmitter at home. Mrs. Koerner gave him an order to fill at the grocery store. Thus radio plays an important part in one household.

The Antenna and Power Equipment of KDKA

THE antenna at KDKA consists of 6 wires, 190 feet in length of 2n foot spreaders. The antenna is supported 210 feet above the ground by a brick smoke-stack at one end and by a 100 foot pipe mast on the nine story building at the other end. The operating room and studio are located on the ninth floor of this building. The mast end of the antenna is shown above. A counterpoise which is a duplicate of the antenna in construction, is placed 110 feet beneath the antenna. This brings the counterpoise about 15 feet below the transmitting set. The down lead from the antenna and the counterpoise lead are made up of 8 strands of No. 14 copper wire equally

spaced around 1½-inch diameter wooden spacers. The natural period of this aerial system is approximately 412 meters. A series condenser of 0005 mfd. capacity is used in series with antenna and sufficient loading inductance added to obtain the desired wave length of 360 meters.

A series condenser is shunted by the radio frequently choke coils of 10 millihenrys inductance in series with a megohm resistance, to drain off any static charge that might accumulate on the antenna when insulated from the ground by the series condenser. The high frequency resistance of the antenna system at 360 meters wave length is approximately 12 ohms. A large percentage is resistance.

Radio brings it
MAGNAVOX
tells it

EQUIP your receiving set with a Magnavox Radio, the reproducer supreme, and you will enjoy every wireless program at its best.

The Reproducer Supreme

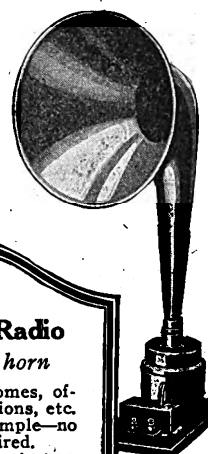
With the Magnavox Radio you hear every wireless program at its best—your receiving set only brings the message while Magnavox tells it clearly and in volume ample for dances, parties and other entertainment.

After once using a Magnavox Radio you would no more go back to the telephone head-set than you would exchange your electric light for a feeble tallow candle.

No wireless receiving set is complete without the Magnavox Radio.

Magnavox Radio—

The Reproducer Supreme



R-3 Magnavox Radio with 14-inch horn

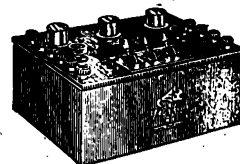
Ideal for use in homes, offices, amateur stations, etc. The hookup is simple—no adjustments required.

Price, \$45.00

R-2 Magnavox Radio with 18-inch horn

Serves the requirements of professional use for camps, summer hotels, etc. Requires only .6 of an ampere for the field.

Price, \$85.00



Magnavox Power Amplifier— Model C

Insures getting the largest possible power input for your Magnavox Radio.

AC-2-C 2-Stage, \$80.00

AC-3-C 3-Stage, \$110

Any Radio dealer will demonstrate for you, or write to us for descriptive booklet and name of nearest dealer.

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Oakland, California
N.Y. Office: 370 Seventh Ave.
Penn. Terminal Bldg.



A REAL VARIABLE

THE HAYNES VARIABLE CONDENSER was designed before it was built. IT DOES NOT LEAK. DEALERS—Here is a condenser worth twice the price, yet there is plenty in it for you. Write for particulars. We can make delivery.

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**VARIOMETERS
UNWIRED**

Mahogany wood turned cup, white wood ball ready for wiring. Range 175 to 600 meters. Ready for immediate delivery in any quantity. Workmanship guaranteed.

SAMPLE SET, \$1.10

The Ever Ready Woodworking Co.

810-12 East 5th St., New York City
Phone Orchard 5585

HERE THEY ARE!

EBY

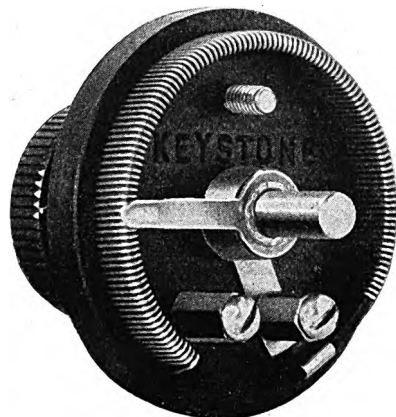
**BINDING
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See them at your dealers.

Corporal

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**KEYSTONE
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**RESISTANCE 6 OHMS.
CARRYING CAP., 1½ AMPS.
LIST PRICE, \$1.00**

DEALERS AND JOBBERS
Wire or Write for Discounts.
Immediate Delivery
Manufactured by

Keystone Radio Company
Dept. W. GREENVILLE, PENN.

**Mystery Waves of Radio
Use Human Body as
Medium**

NEW thoughts which the spiritists can offer us are more interesting and more "spooky" than many which are pointed out to us by those who know of the "inner workings" of the radio wave, says a writer in *The Globe*, New York.

It gives one a kind of chill, for instance, to think that our bodies are constantly acting as conductors of radio waves. It would be interesting to be able to understand them as they go through us, but so far we have not heard of any spiritistic medium sufficiently sensitive to detect code or music passing through the ether which permeates the space between the atoms which make up our bodies. Such sensitivity might yield some interesting results, although it is to be feared that the over-fastidious might sometimes be shocked by the things they heard from radio operators trying to adjust their machines.

Another puzzling phenomenon is that a message uttered by someone standing in front of a microphone used for broadcasting would be heard around the world through the radiophone before the voice of the speaker would be audible to a person sixty feet away. This is obvious because the voice travels only with the velocity of sound, 1,090 feet per second, while radio waves travel with the speed of light, which is 186,000 feet per second.

New Radio Publications

A PAPER by R. T. Cox, entitled "Standard Radio Wavemeter, Bureau of Standards Type R70B," describes a standard wave-meter constructed at the Bureau of Standards and used in the standardization of radio apparatus.

"An Electron Tube Amplifier for Amplifying Direct Current," a paper by H. A. Snow, describes an amplifier which has been developed at the Bureau for particular applications in electric-signaling work. It may be used in place of a polarized relay and, also, for various other purposes including the recording of telegraphic and radio signals.

E. L. Hall and J. L. Preston have prepared a report entitled "High-Voltage Storage Battery for Use with Electron Tube Generators of Radio-Frequency Currents," describing a special type of storage battery developed at the Bureau. This battery employs a considerable number of small storage-cells contained in small glass jars about 1½ inches square and about 4 inches high. The cells are assembled very compactly in trays which can supply 100 volts.

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Including 2,000-ohm Phones
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Can be installed in 30 minutes
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Columbia Electric Motor Co.

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Telephone: 3731 Hoboken

Latest broadcasting map, 15c. That is, a complete broadcasting map appeared in RADIO WORLD, No. 8, dated May 20. Mailed on receipt of 15c. Radio World Company, 1493 Broadway, New York City.

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1493 Broadway, New York City.

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Send for our new Price List.

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an established, growing concern, clearly outlines the Profit Possibilities of the company's shares.

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Industrial Expansion Service
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If you did not get copies of Radio World No 1 to No. 15 send us \$1.90 or we will send you this paper for one year, (\$6.00 for 52 issues) and start it with our first issue, which will be mailed you as soon as possible after receipt of order.

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Many of your customers will want the first fifteen issues of Radio World. Your wholesaler may have a few copies on hand. Inquire. If you cannot get back numbers write us and we will try to supply you so that your customers will have a complete file of Radio World from the first issue.

If you happen to have a few copies on hand, keep and display them and you will find that they will sell. Very shortly it will be impossible to get back numbers of these earlier issues.

Radio World, 1493 Broadway, New York City.

RADIO WORLD

TELEPHONE, BRYANT 4796
PUBLISHED EVERY WEDNESDAY (Dated SATURDAY OF SAME WEEK)
FROM PUBLICATION OFFICE,
1493 BROADWAY, NEW YORK, N. Y.
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FRED S. CLARK, Manager, 1493 Broadway, New York.

ASSOCIATE EDITORS:

Robert Mackay Fred. Chas. Ehlers

SUBSCRIPTION RATES

Fifteen cents a copy. \$6.00 a year. \$3.00 for six months. \$1.50 for three months.
Add \$1.00 a year extra for postage to Canada and foreign countries.

Receipt by new subscribers of the first copy of RADIO WORLD mailed to them after sending in their order, is automatic acknowledgment of their subscription order.

Advertising rates on request.

Entered as second-class matter, March 28, 1923, at the Post Office at New York, New York, under the act of March 3, 1879.

IMPORTANT NOTICE:

While every possible care is taken to state correctly matters of fact and opinion in technical and general writings covering the radio field, and every line printed is gone over with a scrupulous regard for the facts, the publisher disclaims any responsibility for statements regarding questions of patents, priority of claims, the proper working out of technical problems, or other matters that may be printed in good faith and on information furnished by those supposed to be trustworthy. This statement is made in good faith and to save time and controversy in matters over which the publisher cannot possibly have control.

Radiolets

JIMMY—You take this wireless receiver I just finished makin', and go downstairs in the cellar; hold it close to your ear and listen.

Freddy—(After waiting in suspense for several moments in the cellar), Aw—it's a fake, I didn't hear a thing.

Jimmy—"Good! That shows it's workin' right. I didn't say anything yet.—*Boston Transcript.*"

* * *

Skeptic—Say, what is this part of the machine?

Radio Hound—That! Why, that's a tuning coil.

Skeptic—Oh! So that's where the tunes come from. I thought you said they came from Pittsburgh.—*The Sun, New York.*

* * *

What we may expect to hear next:

"I am returning your coin. The air is busy," or perhaps, "Say, operator, you gave me the wrong wave length."—*The Globe, New York.*

* * *

Yes, it is a fact that radio has the country "by the ears."

* * *

Eddie Foy, the comedian, in casually speaking of the success of a vaudeville team, remarked, "They have swept America 'like the radio.'"

* * *

Hairdressers have evolved the "radio wave." The first henna-haired woman on whom it was tried sparkled. "Somehow, I can't get your drift."—*Evening Telegram, New York.*

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No. of Plates	M.F.D. Capacity	Assembled	Knocked-down
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Lott's Better Radio Condenser Co.
473 ORANGE STREET NEWARK, N. J.

RADIO WILL MAKE YOU MONEY

Well known established concern manufacturing WIRELESS specialties offers investors an opportunity to participate in big profits to be made in the WIRELESS INDUSTRY EXPANDING BUSINESS. Not a promotion.

ALL CAPITAL STOCK—

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Factory, offices and demonstrating rooms, Testimonials open for inspection. Strictest investigation invited. Call or write for information.

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will be

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RADIO WORLD

1493 Broadway New York

QUESTIONS and ANSWERS

Ask RADIO WORLD any questions about Radio. Subscribers are answered in next week's issue. New wonders of the marvelous wireless illustrated and fully described in each weekly issue. All newstands at 15c a copy. Subscriptions, 3 months, \$1.50; six months, \$3.00; one year (\$3 numbers), delivered to your home, \$6.00. RADIO WORLD, Room 326, 1493 Broadway, N. Y. C.

IMPORTANT TO RADIO WORLD SUBSCRIBERS

If you took a three-months' subscription to Radio World, beginning with No. 5, dated May 6, 1922, please note that your subscription expires with this number, now in your hands.

Send in your renewal at the regular rates—one year, \$6.00; six months, \$3.00; three months, \$1.50, direct to Subscription Department, so that you will have a complete file and not miss a number.

RADIO WORLD, 1493 Broadway, New York City

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Radio Merchandising

Classified Quick-Action Advertisements, 5 cents per word

Telephone Bryant 4796

Service Will Decide

THE appended editorial, from "The Evening Mail Radio Review," presents a problem of vast importance to the radio-merchandising world, RADIO WORLD will be pleased to have the views of any person interested, either as a user or manufacturer or seller of radio goods. There is absolutely no doubt that radio is to be one of the gigantic industries of the future—employing thousands of skilled men and women, and engaging millions in capital. Its benefit to the people, both commercially and as a source of entertainment, cannot be doubted. That it must be standardized as a business, nobody will deny. But—to what element of the business world does radio belong? Read the "Mail" editorial and let us have your personal views.—The editors.

To whom does the radio business belong? Shall the electrical dealers have it, or shall it pass into the hands of the phonograph dealers? This question will have to be decided before long. At the present time it's "anybody's dog." We see radio in the drug stores, the hardware shops, the toy shops and many other places where it does not belong. However, this is a temporary condition. In the future the sale of radio equipment will fall into the hands of two or possibly three definite classes of dealers.

There is a question as to whether or not stores handling radio instruments only can have a place in the scheme of things. At the present time the owners of such stores manage to make a living; but when the industry settles down, such establishments will probably find business hard to get, because the sale of small independent parts will gradually fall off and the more expensive complete instruments will come into favor.

The electrical dealers argue that radio belongs to them since radio instruments are essentially electrical products. True, radio instruments are electrical, but that does not mean they should be sold by electrical dealers, if these dealers cannot give the public service that another class of dealers could.

The writer has given this matter considerable thought, and is of the opinion that the phonograph dealers are best fitted to handle complete radio receivers. They have the booths all ready for their patrons, and furthermore, they are thoroughly acquainted with the sales plan, under which the more expensive radio receivers will eventually be sold. Reference is made to the time-payment plan.

Radio will never fully develop in this country until the manufacturers cooperate with the dealers in arranging time payments. The average American home cannot afford an expensive instrument unless convenient payments are arranged. The phonograph industry did not amount to the proverbial row of pins until the

dealers were able to arrange monthly payments. Before that time the \$25 machine reigned supreme. Who can deny that the \$25 crystal receiver does not reign today? Indeed, we have a condition that is very similar to that which existed in the phonograph industry a number of years ago. When a man goes into a phonograph shop today he is insulted if the clerk shows him a cheap machine.

Within a short time the radio industry will develop in such a way that the position of the established phonograph dealer as a merchandiser in this field will be greatly strengthened. The combination radio receiver and phonograph is the logical answer to the problem that stands before us today. The phonograph must stay with us. It is an instrument of boundless utility, and, furthermore, it is a natural partner of the radio receiver.

In the majority of cases the radio receivers of to-day look like scientific instruments rather than articles of furniture. With their knobs, dials and switches, they do not harmonize with the surroundings of even the most modest American home. The phonograph is both a musical instrument and a thing of beauty. It is ornamental and pleasing in its appearance. Furthermore, the phonograph has a horn which is ideal for radio. This one horn could be used for phonograph music and radio concerts.

Sound reasoning points to the combination radio and phonograph. The handwriting is on the wall. When this development does come, the phonograph dealers would be the logical merchandisers of this product—providing they don't starve to death in the meantime.

Although matters appear to favor the phonograph dealer, this writer would be inclined to accept a buyer's viewpoint and simply say, "Let those who would control the merchandising of radio receivers get out and fight for their business, for, after all, it will be the man who is able to render maximum service to the buying public who will win out. Who cares who sells radio as long as intelligent and efficient service is given those who invest their money in instruments?"

Brooklyn Firm Opens

THE Specialty Service Company, of Brooklyn, began operations last week as manufacturers and distributors of a complete line of transmitting and receiving equipment and parts. The office of the company is at corner Fourth Avenue and Pacific Street, one block from the Long Island Railway Station.

With the Specialty Service Company is associated a well-known Brooklyn Radio figure, Frank A. Mahler, who is known just as well by his call letters, 2RM. Mr. Mahler will have charge of the company's radio-sales department, and will be in an excellent position to look after the wants of the radio trade in view of its past experience. The products of the new company will bear the imprint "RiteRadio."

New Firms and Corporations

Notices in this department are considered as purely interesting trade news and published without compensation to us. We welcome trade news of this nature. All notices having an advertising angle are referred to our Advertising Department, and are placed under Classified Advertising at 5 cents a word, or as Display Advertising at \$5 an inch.

(The firms and corporations mentioned in these columns can be reached by communicating with the attorneys, whose addresses are given whenever possible.)

The General Radio and Electric Corporation of America, 1 Union Square, New York, has been founded to manufacture, among other things, a radio slot-telephone for hotels and apartment houses.

Federal Electric and Radio Corp., Wilmington, Del., devices, \$500,000. Corporation Trust Co. of America.

Armstrong Research Corp., New York, patents, \$1,000,000. U. S. Corporation Co.

Mydar Radio Co., Newark, N. J., radio enterprise, \$100,000; H. Clayton Seamon, W. Lee Darby, Theo. F. W. Mayber, Newark, N. J.

Picturadio Corp., Manhattan, \$100,000; E. T. Davis, S. M. Valentine, E. J. Vail. Attorneys, Davis, Donohue & Deitz, 140 Nassau St., New York.

Audible Radio Corp., New York, manufacturing, \$250,000. Registrar and Transfer Co.

Pioneer Radio Products Co., 329 East 29th St., New York City.

The Radio Phone Sales Company, Grebe and Clapp-Eastham Equipment, Enid, Oklahoma. J. T. Heins, manager.

Clover Leaf Radio Club, Newport News, Va. J. N. Roane, president; G. R. Conner, secretary and treasurer.

Hoosick Falls Radio Parts Manufacturing Co., Inc., Hoosick Falls, N. Y.

Change of Address

The Packard Engineering Company has moved its offices to 1200 West 76th Street, Cleveland, O.

A New and Novel Loud Speaker

AMONG the many loud-speakers that have been developed in connection with radio the Shelstone Loud Speaker, just introduced, proves to be an interesting invention.

The inventor has cleverly avoided using a horn to amplify the sound, but, instead, has developed Shelstone the design of which is absolutely different from any other radio speaker, yet shell, or bowl, shape has been admitted for years to be the proper and true way of amplifying sound. Many prominent band stands are built on this plan. The pulpit of the Cathedral at Rheims, France, is built shellshape.

In perfecting a loud-speaker along these lines, the difficulty has been to carry the sound from the receiver, or receivers, correctly and in true tone to the sounding board. This difficulty has been overcome in the invention of Shelstone. At the base of the sounding board is an open tone-chamber. Any two standard receivers fit over this tone chamber.

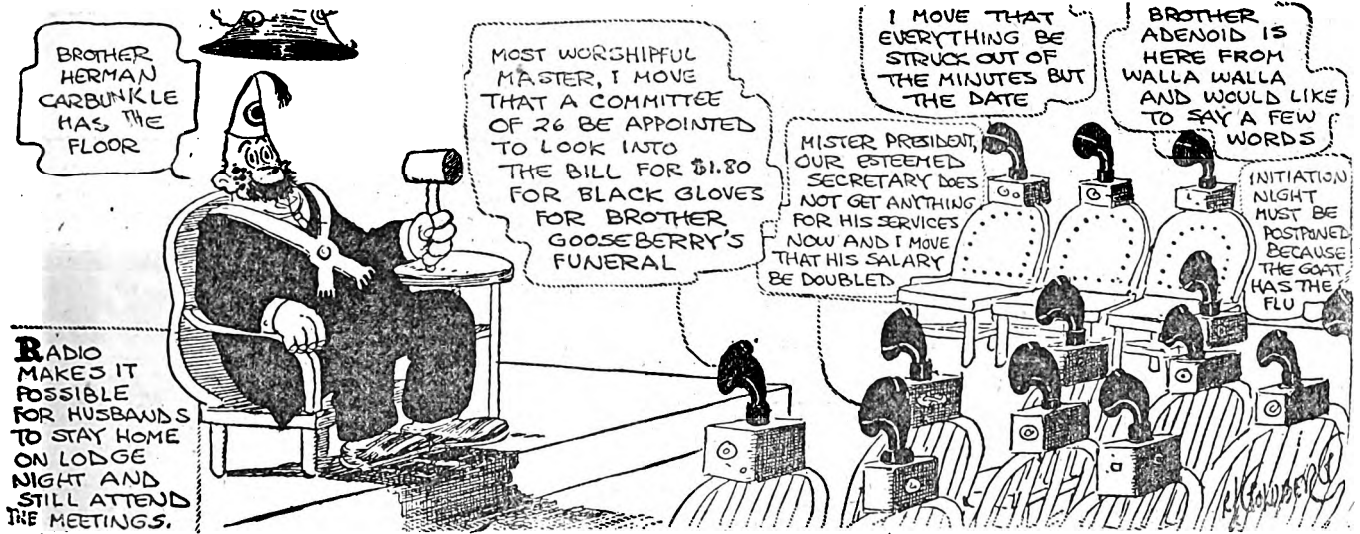
The tones leaving the two receivers are accepted in the tone chamber, which is correct in depth and shape. Here the tones consolidate, meld gently, as tones must do, then immediately and freely leave the tone chamber, without distorting or choking, to glide to the amplifying and projecting sounding-surface, giving the tones the greatest possible acoustic amplification.

The receivers are easily accessible for tuning in, as they are not screwed or fastened in any way to the tone chamber. Shelstone is surely different.

Shelstone is convenient in size, portable, and attractive in design.

A Lodge Meeting of the Future

R. Goldberg in "The Evening Mail" New York



Coming Events

The editors of RADIO WORLD will gladly publish news items of all contemplated radio shows and expositions. Keep us posted by mailing full information.

ANNUAL SHOW OF THE ST. LOUIS RADIO ASSOCIATION, St. Louis, Mo., October 4 to 7, inclusive.

CHICAGO RADIO SHOW, Coliseum, Chicago, Ill., October 14 to 22. U. J. Hermann, managing director, 549 McCormick Building.

INTERNATIONAL RADIO EXPOSITION, Grand Central Palace, New York City, December 21 to 30.

KANSAS RADIO EXPOSITION will be held at the Kansas State Fair, Hutchinson, Kansas, September 16 to 22 inc. A. L. Sponsler, secretary.

MERCHANTS' COOPERATIVE ADVERTISING AGENCY RADIO SHOW, Robert Treat Hotel, Newark, N. J. Date not set. Will be held late this year.

"RADIO DAY," Pittsburgh, Westview Park, August 24. Under auspices of Radio Engineering Society. C. E. Urban, secretary.

RADIO CLUB OF AMERICA. First autumn meeting will be held the last Friday in September. Reaville H. McCann, secretary. Columbia University, New York.

CLEVELAND RADIO AND ELECTRICAL EXPOSITION, Cleveland Public Auditorium, Cleveland, O., August 26 to September 4, inclusive.

Why It Is "Radio"

IN the early days of communication by Hertzian waves, the outstanding novelty of the new system lay in the absence of connecting wires between the two communicating stations. Hence the term "wireless" was coined to describe this form of telegraphy, a term which though rather crude, still expresses in a popular way the main point of interest.

As the art progressed, attention became focussed more on the extremely high-frequencies of the alternating currents used, this being known as "radio frequencies" as opposed to the "low frequencies" of ordinary power practice, such as 25-cycle and 60-cycle systems as used in house lighting and for ordinary electric power. With this in view, the new means of communication became known as "radiotelegraphy," or abbreviated as "radio."

What We Should Have Said

Regarding that speed record of "ninety words a minute," which we attributed to William M. Allen, the

youngest radio expert, in the caption on the front cover of RADIO WORLD, No. 15, dated July 8, we did not intend to be misleading. The statement was correct technically, but we should have stated further that he handles this speed mechanically. That is, young Mr. Allen receives it on a phonograph

record. It is then taken on another machine and reduced to thirty words a minute to be copied by sound reading.

RADIO WORLD thanks those of its many readers who brought this error to the attention of its editors who are aiming at all times for the bull's-eye of absolute accuracy.

DE FOREST RADIO PARTS For Those Who Build Their Own

The same care should be taken when purchasing Radio Parts as when buying a complete Receiving Set. De Forest Radiophone Parts are unequalled in quality of materials, workmanship and correctness of design. Insist upon De Forest when purchasing the following instruments:

Rheostats

Switches

Grid Leaks

Condensers

Coil Mountings

Duo-lateral Coils

Tube Receptacles

Crystal Detectors

Amplifying Transformers

De Forest

"Famous For Dependability"



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Auto—Electric and Magnet Wires
Dealers write for magnetic wire price lists
on 1- $\frac{1}{2}$ and $\frac{3}{4}$ -lb. spools

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181 McDougal Street Brooklyn, N. Y.

86,960 NAMES

Increase your sales by using names and addresses
of firms and individuals interested in everything
in Radio.

310 Radio Manufacturers in the U. S. \$3.00
650 Radio Supply Jobbers in the U. S. 5.00
6,500 Retail Radio Dealers in the U. S. 35.00
5,000 Amateur and other owners radio
apparatus 10.00
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50,000 Amateur and other owners radio
apparatus 75.00
Amateur Radio Directory of the U. S. Complete
list of Amateur stations with names and ad-
dresses of operators or owners. Prepaid for \$5.00
Names and addresses are guaranteed 98% correct
will refund postage on all mail returned as un-
deliverable if less than 98%. Remit with order.

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Dealers All Over the Country
Handle Our Standard Radio Goods.

DO YOU?

OUR TRADE PRICES
AFFORD GOOD MARGIN.

**WIENER WIRELESS
SPECIALTY COMPANY**21 ACADEMY STREET
NEWARK NEW JERSEY**Island without a Country
Has Call "US"**

OFF Honduras, in the Caribbean Sea, is situated a little piece of land called Swan Island, where Americans have lived for many years although the nationality, or ownership, of the island has never been decided. On this "Island without a country" the United Fruit Company has a commercial radio station and uses the call "US," which, however, is not a United States' call but an outlaw call chosen by the company in 1909. Although Italy owns the three letter calls from UPA to UZZ, US does not come within the control of that country any more than does the island itself. If the island came into the possession of the United States, the station would lose its identifying call, as all United States' calls begin with the letter N, K or W.

Radio for Small Fleets

CARL C. HANSON, inventor of the device for guiding ships into a harbor during a fog, has announced a new device for making sea travel less costly in life and property. It requires the equipment of the schooner in a fleet of dories with a 1-k.w. transformer, a motor-generator, a "chopper wheel," which sends out the signal and an aerial attached to the masts. The other ships each have a receiving set so small it can be placed under a thwart. The chopper wheel would furnish a continuous moaning noise which would enable the dories to locate the mother ship in the thickest fog. The installation for a fleet of twelve dories would not exceed \$2,000.

Old Bill Shakespeare seems to have been somewhat of a radio bug himself, for he hooked up "The Tempest" to an Ariel.—Roy K. Moulton, in *The Evening Mail*, New York.

Latest broadcasting map 15c. That is, a complete broadcasting map appeared in *Radio World*, No. 8, dated May 20. Mailed on receipt of 15c. *Radio World* Company, 1493 Broadway, N. Y. C.

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— REPAIRING —**

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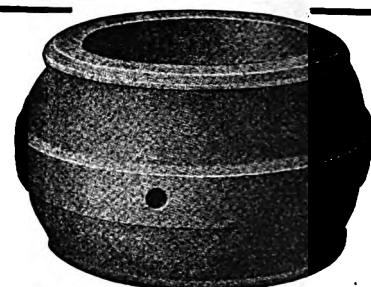
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Importance of the Electron Tube

MUCH of the fascinating and mysterious future possibilities which have surrounded this (radio) work of recent years seems to be due to the wonderful device, the 'valve' or 'electron tube,'" says Edward J. Nally, president of the Radio Corporation of America, in an interview in *The Times*, New York. "First used for simple receivers, then as amplifier, then as a transmitter, then for land line work, it soon may be used for commercial power purposes. It seems impossible to conceive the uses to which the device may not ultimately be applied. In the business of commercial communication, however, it is not so much what a device may be able to do in the future as what can be done with it to-day that really matters.

"What has been the story of the electron tube? As a generator or transmitter it was first used about 1911, only exceedingly small amounts of energy being used. Now in 1922, we have a powerful experimental set undergoing its final development by test in the Carnarvon station. Doubtless within a few years this type of equipment will assume commercial form and become an alternative type of equipment, with alternators use in commercial long distance transmitting stations.

"For telegraph purposes, the value of the alternator tube transmitters will probably be about the same in that they are both simply high-frequency alternating current-generators, though of different types. That the first cost or operating costs of the two types will be materially different, is hardly conceivable; but it is to be expected that the tube will be a much more useful and convenient device for telephony over long distance."

To Exchange Radio Operators

TO perfect radio communication all over the world, W. A. Winterbottom, traffic manager of the Radio Corporation of America, has invited foreign stations to exchange operators with American stations, and the system is a great success.

"We have had operators from England, Germany and Norway in this country," said Mr. Winterbottom to a reporter for *The World*, New York. "We are about to send a group of our Pacific Coast operators to Japan in exchange for a number of Japanese.

"This is the way the system works: The Norwegian operator, for example, sends from one of our American stations to an American operator in Norway. Thus both learn conditions of sending and receiving, and when they return home are more valuable.

"Actual sending and receiving is by machine, of course, but the translation of messages into tape perforations is by hand, and this human element will never be eliminated.

"International radio communication is driving the Continental telegraphic code down America's throat. We have been very sentimentally attached to our Morse code and have paid no heed to the adoption of the Continental code by every other country in the world.

"But when we started sending radio messages we found that foreign countries could only receive and send in Continental code, so that we have had to adopt that code for radio work whether we liked it or not."

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Subscribe for RADIO WORLD. \$6.00 a year, \$3.00 six months, \$1.50 three months.

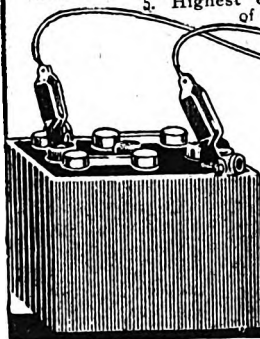
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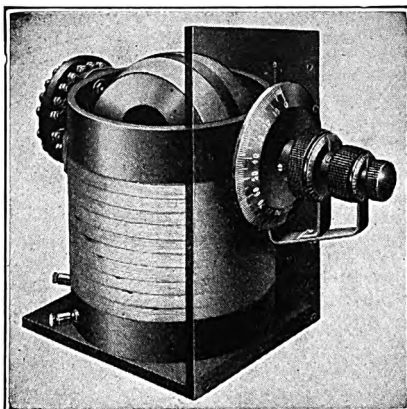
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Every dealer should sell this new Norris "Selector" Vario-Coupler because it is an instrument each "Fan" will want. It combines in one compact unit, an efficient and accurately designed vario-coupler and the necessary tuning switches. It is actually three instruments in one as separate controls are provided for both the coupling and each of the two primary switches.

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 TIMES," by John Kent, that appeared in
 RADIO WORLD No. 13, dated June 24, 1922,
 the publisher decided to put aside a number of
 copies for those who were not able to get this
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 taining the article about Major Armstrong's
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 RADIO WORLD, No. 8, dated May 20.
 Mailed on receipt of 15c. Radio World
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Sounding the Deep by Radio

THE destroyer, "Stewart," equipped
 with the Sonic Range Finder, used
 for sounding at sea, has made a prac-
 tical test trip from Newport R. I., to
 Gibraltar, Spain. The new method is
 closely related to radio, depending on
 the transmission of sound waves through
 water, and is employed to measure
 depths of the ocean. Soundings are made
 by measuring the length of time required
 for sound oscillations sent out from the
 ship to travel to the bottom of the ocean
 and back again. Dr. Harvey C. Hayes,
 of the Naval Engineering Technical Staff,
 who aided in the development of the new
 naval equipment, is making the trip on
 the "Stewart."

Daily reports from the destroyer, dur-
 ing her trip across the Atlantic, indicate
 that the apparatus is a success. Sound-
 ings were taken at regular intervals with-
 out stopping the ship, and indicated
 depths from 90 to 2,500 fathoms. These
 soundings correspond to those taken by
 the old laborious method with the wire
 and lead, which required the stopping
 of the ship for one or two hours during
 the operation.

Honeycomb Gaining Popularity

THE honeycomb coil is gaining popu-
 larity, because of the mounting
 that makes it possible to change the
 individual coils and thus alter the wave-
 length reception. The ease of tuning by
 separating the coils more or less later-
 ally is also important. Another point
 is the easy adjustment of a third coil to
 act as "tickler" in the regenerative cir-
 cuit. It should be understood that the
 tickler coil is available only for sets
 having an electron-tube detector, so-
 called regeneration involving a third cir-
 cuit, the plate circuit, in connection with
 the B battery, which of course does not
 exist in the crystal detector set as or-
 dinarily used.

Care of Storage Batteries

MANY users of storage batteries in
 radio receivers are first warned that
 the cells are almost discharged by their
 inability to light the detector and ampli-
 fier tube filaments to normal brilliancy.

It is not a good plan to allow storage
 batteries to run down to the point where
 they are incapable of lighting the vacuum
 tubes properly. Batteries should be re-
 charged as soon as they have fallen off
 to about one-half of the full charge.

The condition of the storage batteries
 may easily be determined by using a hy-
 drometer. This instrument is simply a
 combined syringe and float which may
 be purchased at any automobile supply
 store, and which indicates directly the
 specific gravity of the solution in the
 storage cells.

By testing each cell with a hydrometer
 at regular intervals, say once a week, it
 is easy to keep informed as to its state
 of exhaustion. When the cells are fully
 charged the hydrometer will show a
 reading of about 1.280. When they are
 half-way exhausted the reading will be
 about 1.215. If the specific gravity falls
 to a point indicated by 1.150 on the hy-
 drometer scale, the battery is practically
 exhausted.

It is best to arrange to recharge the
 storage cells as soon as the hydrometer
 reading falls below 1.200—John V. L.
 Hogan, in "The Evening Post," New
 York.

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How the Leonard-Britton Fight Was Radioed

THE mechanism by which the report of the Leonard-Britton fight was sent out from the ringside was as follows:

With the aid of a microphone and varying audio-frequency (two or three stages) the voice of the reporter, J. Andrew White, was sent over the American Telegraph and Telephone Company's wires to WJZ. There another stage of amplification was added, and the voice carried to a double-pole, double-throw switch. By means of the latter J. O. Smith, who was operating in Newark, could either talk to Mr. White himself or put him on the air, as he chose. Mr. Smith reports that it was at first necessary to correct the modulation from the ringside several times before allowing it to go to the regular transmitter.

When the modulation was satisfactory the voice of the reporter was carried through the 5-watt transmitter, from there to the 50-watt amplifier, thence to the three 250-watt modulator tubes and so through the oscillators to the antenna and into the air.

The Westinghouse Company declares that the experience of the hundreds of listeners who have already written in indicate that there was little atmospheric trouble.

Washington Post Office Radios All Matter

COMMENCING JULY 1, Station WYX of the United States Post Office at Washington, D. C., began to broadcast all its varied information on the radiophone on 1160 meter waves, so that all may get the latest weather, crop, and market news without knowing code.

The daily schedule, except for the Saturday closing at 1 p. m., is as follows:

- 10:00 a. m.—Weather (Eastern-Central only.)
- 10:30 a. m.—Washington wholesale fruits and vegetables.
- 12:30 p. m.—Live stock, openings St. Louis and Chicago (form 41.)
- 2:15 p. m.—Chicago and St. Louis live stock closing (form 20.)
- 3:00 p. m.—Crop report and special market news.
- 3:30 p. m.—General fruits and vegetables.
- 5:00 p. m.—Wholesale dairy produce, New York and Chicago (form 59.)
- 5:30 p. m.—Grain report.
- 7:30 p. m.—Live stock and grain.
- 8:00 p. m.—Fruits and vegetables.
- 9:30 p. m.—Weather.

Veterans' Bureau Broadcasts "Want Ads"

BY means of the United States Navy's radio broadcasting station at Anacostia, D. C., NOF, the Veterans' Bureau Employment Service is broadcasting to veteran radio fans opportunities for employment, and is also broadcasting the names, for the benefit of prospective employers, of "Vets" skilled in various trades and professions who are in search of employment.

The first "Radio Want Ads" went out last week and several replies have been received; two men, at least, are now in direct touch with prospective employers.

The broadcasting is a part of the Bureau's plan to establish national and departmental clearing houses for social, industrial and professional employment. Officials of the Bureau believe that with the radio they are getting into closer touch with both the Veterans and the employers, as they reach the family circle in an even more personal way than through the newspapers.

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The "All Wave" coupler, plus the Radio Stores Condenser, gives the Radio Phonolier a range of from 150 to 3,000 meters.

The Radio Phonolier is built of solid copper, and finished in Bronze, Silver or Gold, with lamp shades to match or contrast with interior decorations.

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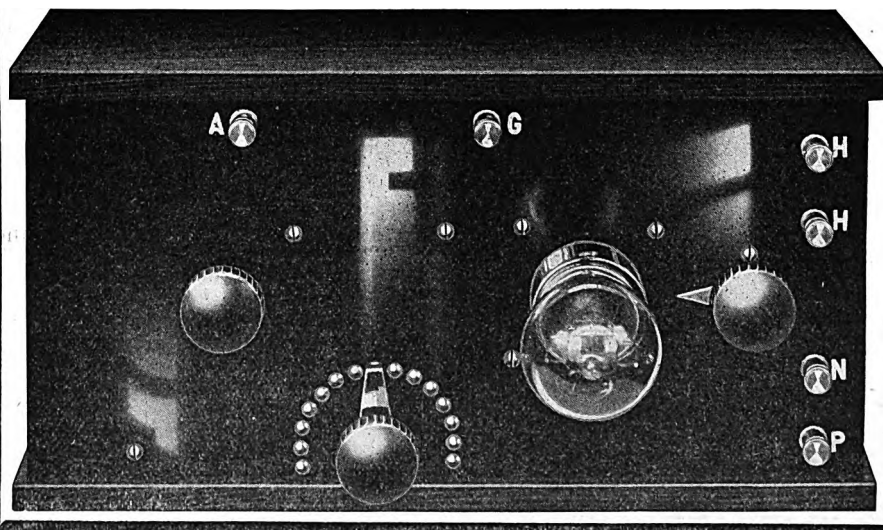
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VACUUM TUBE DETECTOR SET

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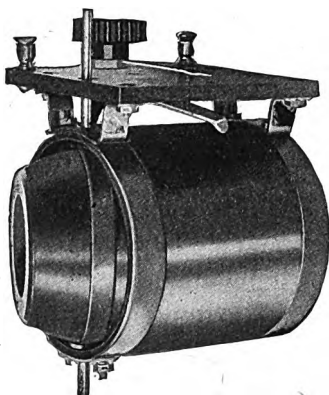
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Approved Tests for Receiving

By John D. Hayes

WASHINGTON, D. C.—The Bureau of Standards of the Department of Commerce, and the Electrical Testing Laboratories of New York, have approved in outline a method for immediate use in the testing of complete receiving sets manufactured for radiotelephone broadcast reception. Improvements on these methods, or new methods used in testing the equipment submitted by the National Retail Dry Goods Association, will be subject to approval of the Bureau of Standards, which will co-operate with the Electrical Testing Laboratories in the establishment of these methods as standard procedure.

It is recognized that there are a great many other organizations which would be interested in, and benefited by, any action regarding performance tests and the standardization of radio equipment, and it is desirable that the interest in this work be co-ordinated as thoroughly as possible.

There were present at the conference on Testing and Standardization of Radio Equipment, held at the Bureau of Standards, in Washington, Dr. C. H. Sharp and H. L. Bedenbender, representing the Electrical Testing Laboratories, New York; Harold R. Young and Arthur Wiesenberger, representing the National Retail Dry Goods Association; and Dr. J. H. Dellinger, L. E. Whittemore and J. L. Preston, representing the Bureau of Standards.

The Investigating Committee of the National Retail Dry Goods Association, composed of F. W. Tully, chairman, C. S. Hammond, Joseph Fisher, S. J. Ryan and Alfred Fantl, reported that its members very generally are becoming engaged in the sale of radio-receiving equipment. They find that there is no information available for them to use in the selection of good apparatus and in the rejection of apparatus which is not satisfactory in operation and is, therefore, detrimental to their established good will in their communities.

There was considerable discussion of the need for standardizing some features of the design and construction of radio-receiving equipment, for measuring and rating the performance and for determining which receiving sets are of durable construction. From the commercial standpoint, the Investigating Committee of the National Retail Dry Goods Association had defined the solution as being standardization, by responsible manufacturers, of the efficiency of their various receiving sets, marking plainly on each instrument the receiving radius under every atmospheric condition. The discussion brought out the fact that this is a very difficult problem and one which is impossible to accomplish by a brief statement or mark on the receiving set. A large number of factors enter into the determination of the range over which signals can be received with a given receiving set. These include the strength of signals which the receiving operator expects, the height and location of the receiving antenna, the power of the transmitting station, and its location with respect to other stations which are capable of causing interference as well as the sensitivity of the particular receiving set.

The great need for the development of methods for determining the performance of radio receiving apparatus is a relatively new one and has been made necessary by the recent large production of receiving sets varying enormously in quality and performance.

—A L-O-U-D S-P-E-A-K-E-R

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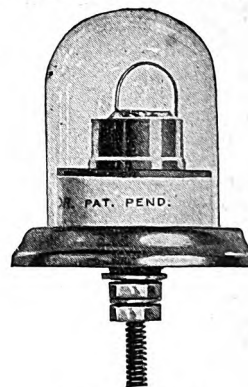
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9 Central Ave. Newark, N. J.

Broadcast Bill's Radio-lays

By William E. Douglass

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CAN'T say that livin' on a farm is just one long sweet song; but all these here conveniences is helpin' things along. I recollect, not long ago, when I went out at night to see if all the stock wuz in an' all the gates shut tight. I had to take a lantern an' I'd hang it on a nail; then gropin' in the shadder—gosh! it never seemed to fail. I'd crack my shins on somethin'—either tongue or singletree, then right away that stock would hear some rare profanity. But things has changed round here a heap since we've electrified, and now when somethin' new comes up—well I ain't satisfied until I've given it a try to see if it will help



"I stood an' watched her ironin' fer a couple minutes more."

to make farm life more cheerful for my wife an' for myself. Now, radio's my hobby, an' I listen all day through; they call me "Broadcast Bill" because I'm up on all that's new, an' latest songs er latest news it's all the same ter me; whatever's bein' broadcast fills me chuck full of glee. Last Tuesday, I wuz choppin' wood out yonder in the shed, an' all the time my wife had that there harness on her head. She didn't hear me climb the stairs or open up the door; I stood an' watched her ironin' fer a couple minutes more an' then I sez to her, "Well, Min, what's goin' on to-day?" "Oh, Bill," she sez, "it's lovely, I just heard a fellow play a solo on a violin. Go get those other phones." An' so I went an' got 'em, thought I'd sorter rest my bones an' set a spell an' listen 'cause I've found it helps a lot to take things kinda easy when the weather's pretty hot,—leastwise that makes a good excuse. She didn't hafta beg me very hard to get them earmuffs down from off the peg an' that's the way it goes; you see, my wife an' I agree that radio without a doubt "promotes felicity."

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How to Build a Regenerative Set, Detector, and Two-Stage Amplifier, and How to Shield It.

How to Calibrate Your Receiving Set without the use of a Wavemeter.

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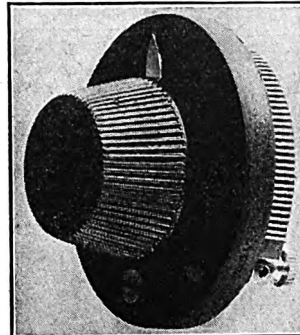
RADIO DIRECTORY AND PUBLISHING CO.

45 VESEY STREET, NEW YORK CITY, N. Y.

Established 1860

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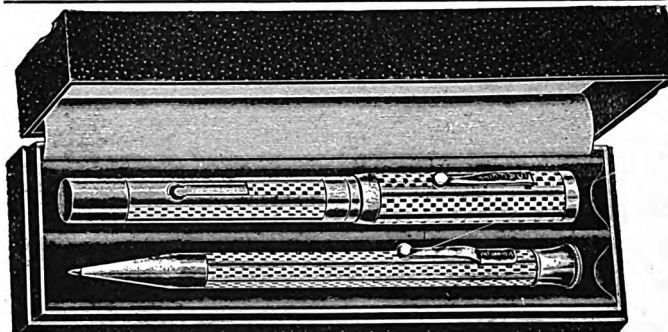
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RUSH your name and address and we will tell you HOW you can get this handsome 14k. Gold Filled Fountain Pen and Pencil Set.

Absolutely Free

REMEMBER, with our plan it WON'T cost you a cent. The set comes to you in an elaborate plush box. Fill out the coupon herewith and mail at once for our FREE PLAN.

Publisher's Promotion Bureau, 120 Patchen Avenue, Brooklyn, N. Y.
Gentlemen: Without any obligation on my part, please send me particulars of the above offer.

Name
Street City

RADIO WORLD'S QUICK-ACTION CLASSIFIED ADS

This department is intended for everybody who wants quick action on short announcements covering the buying, selling, exchanging or general merchandising in the radio field. Readers of RADIO WORLD will find that it pays to read these columns every week. Advertisers will get a two-day service here—that is, copy received for this department will appear in RADIO WORLD on the news-stands ten days after copy reaching us.

The rate for this RADIO WORLD QUICK ACTION CLASSIFIED AD. DEPT. is 5c. per word (minimum of 10 words, including address), 10% discount for 4 consecutive insertions, 15% for 13 consecutive insertions (3 months). Changes will be made in standing classified ads. if copy is received at this office before 4 P. M. on any second Tuesday preceding date of publication. RADIO WORLD CO., 1493 Broadway, N. Y. C. (Phone, Bryant 4798.)

Exchange jolly interesting letters through our Club! Stamp appreciated. Betty Lee, 4254 Broadway, New York City.

DEALERS and JOBBERS

Write for our attractive proposition. Shipments and satisfaction—not disappointments. Service unexcelled. Complete line. G. S. NYCUM, Manufacturer NYCO Radio Supplies, 507 Penwood Ave., Wilkinsburg, Pa.

My Regenerative Receiver and two-step amplifier for sale. Set was made to order. Workmanship and performance unsurpassed. Price, without batteries or tubes, \$75.00. First check takes it. Receiver guaranteed. C. H. Glick, 5 Sheridan Square, New York City.

CHOICE CRYSTALS FOR YOUR RADIO SETS

The Bay City Assay Office, 209 West Holly, Bellingham, Wash., offers Argental Galena Crystals, in pairs, at 25c., 35c., and 50c. Sizes suited to capacity of your receiving set. Every piece has sensitive spots and fully guaranteed.

IS YOUR HOOK-UP RIGHT?

Fifty complete vacuum tube hook-ups, both transmitting and receiving, thoroughly illustrated and described. Only best circuits used. Send 50c. today. Westboard Radio Engineers, 309 Canal Street, New York City.

FOR SALE QUICK—6-60 storage battery, fully charged, \$12.00; 5-dial omnigraph, \$15.00; "NAA" receiving transformer, \$6.00; 3-foot eagle kite, \$1.50. All nearly new. Sell separately or all four for \$30.00. Albert Brown, R. 4, Greenwich, N. Y.

\$1.00 COMBINATIONS—BY MAIL, \$1.00

No. 1—100 ft. No. 14 antenna wire; 20 ft. No. 14 insulated ground wire, 1 ground clamp (solid copper); 1 single pole double throw lightning switch. No. 2—1 8 by 3/4 inch insulated tube, wound with enameled wire; 2 slides and 2 brass rods to fit; 4 nickelplated brass binding posts. No. 3—2 60c. switch-levers (1 3/4 inch); 20 contact points with nuts; 4 stops, 4 binding posts, 1 detector stand (unmounted). No. 4—1 set of 4 radio tubes, 8 inches long by 3-3/4—4-4/4 dia.; one spool No. 24 cotton covered wire, 375 feet; one wood rotor. Enclose Money Order or Checks, but no stamps. Brilliantone Radio Products, 874 Columbus Ave., at 103rd St., New York.

Crystal Set That Gets Radio Concerts. Build it right, boys. Plans and full instructions for building at low cost, high grade fine adjustable Crystal Receiving Set, fifty cents postpaid. Dept. R. D., Shaw Mfg. Co., Galesburg, Kans.

Manufacturers of Rogers Radio Receivers and Rogers Receiving Radiometers. Rogers Radio Company, 5133 Woodworth Street, Pittsburgh, Pa.

High Grade Antenna Wire. Best quality 7 strand No. 22, tinned copper, non-corrosive antenna wire. Only 1c. per foot. The Kehler Radio Laboratories, Dept. W., Abilene, Kans.

WRITE for catalog showing complete line of Elmo Shielded Radio Apparatus, tuners, detectors, amplifiers, transformers and sockets. Electric Machine Corporation, Indianapolis, Indiana.

SALESMEN WANTED—Resident. In various localities. Standard, basic radio parts to Jobbers and Dealers. Splendid opportunity for men able to show past selling record and references. The R. G. Mills, 30 E. 23rd Street, New York City.

BUILD YOUR OWN Electrolytic Storage Battery Charger. Plates and Complete Instructions, \$1.00. Descriptive Circular Free. PEERLESS ELECTRICAL PARTS CO., 105 Harris Street, Rochester, N. Y.

Men, Over 17, Wanted—Steady work. Commence \$135 month. Government Railway Mail Clerks. Common education. List positions free. Write today. Franklin Institute, Dept. G-151, Rochester, N. Y.

PATENTS—Electrical cases a specialty. Pre-war charges. B. P. Fishburne, Registered Patent Lawyer, 386 McGill Bldg., Washington, D. C.

SAVE! Magnavox, \$41.00. New General Electric sets, \$116.00. Stromberg-Carlson fones, \$6.25. R.C.UV 712, \$6.10. Federal, \$6.25. Bakelite dials, 3 1/2" dia., 60c. Federal Plugs, 75c. Jacks, less 33 1/3%. Write for bargains. MACK'S RADIO SHOP, Ansonia, Conn.

RADIO MANUAL—Everything the beginner should know. How to build and operate an inexpensive receiving set. Sixty-four pages, thirty illustrations. Twenty cents. Post paid. RAYDIO PUBLISHING COMPANY, CAXTON BUILDING, CLEVELAND, OHIO.

VARIOMETER SET with dry cell tube and controls. Walnut cabinet, 6 x 14, \$45.00. G. H. Miller, 1672 9th Ave., Huntington, W. Va.

One HARKO Senior receiver for sale. Nineteen (\$19.00) Dollars. L. R. Vogt, Bedford, Ia.

ATTENTION RADIO DEALERS and AMATEURS

Why pay \$0.75 or \$1.00 for HEAD PHONE CORDS? Send us 40c. in coin and we will send you a finely braided complete HEAD PHONE CORD, Postpaid. All orders filled in turn. New England Braiding Co., Calendar St., Providence, R. I.

New AMRAD 2634 and 2596. A Detector and two-step regenerative receiver, regular \$120.00, at \$85.00. New MURDOCK 3000 phones, regular \$6.00, at \$5.25. Write now for other specials. D. G. Fox, 20 Fernwood Ave., Haverhill, Mass.

CRYSTAL DETECTOR SET, from aerial to phones, complete. Big bargain. Send for circular. Salkey Radio Co., 2378 Eighth Ave., New York City.

OVERSTOCKED. Must raise money. Therefore the following bargains: Clapp-Eastham H-R Tuners, \$30.50, with detector tube, \$35.00. Westinghouse R-C sets, with detector two-step, \$115.50, with three tubes, \$122.50. Grebe CR-5, \$74.00, with detector tube, \$78.00. Dollar 3" Dials with knob, 75c. 12c. Composition Top Binding Posts, 9c. each. \$1.00 per dozen. Send money order or certified check. Write for list of other bargains. John R. Koch Co., Charleston, W. Va., Radio Dealers since 1918.

The Basis of Radio

ELECTRONS are the tiny bits of active matter that fly back and forth between sympathetic objects with such inconceivable speed that power is born of their tireless energy. This is the basis of Radio.

We do not see these electrons, but we know that they exist. We prove it by the activities of the audion bulb and by every other improved feature of the wireless discoveries that have been made within a year or so. There has been something there that we could not understand. Some power concealed within the tiniest bits of matter of which we could be sure. It showed itself in many ways. It swayed light currents and made conversation through the ether without wires possible. That was the electron, one of those tiny objects that seem more than human with their mystic power, their strength, their tireless animation. They are the little creatures that carry

the human voice from point to point over dale and mountain and sea and never ask for aid of metal in shape of wire. They principally want to be let alone to do their work, and they are so efficient in doing it that we have been satisfied to let them alone. And very soon they are going to do some still more wonderful work for man. They are going to apply their force to direct power for the household.—Eugene Slade Bisbee, in *The Globe*, New York.

Increase in Rate of Radio Messages

Forty-four ship radio-stations, operated and controlled by the Ship Owners' Radio Service, increased the ship message rate from 4 cents to 8 cents per word for all classes of ship service, beginning July 1. The radio ship-stations owned by the Alaska Steamship Company, which are also operated by the Ship

Owners Radio Service, will not, however, increase the present rate of 4 cents per word.

Norwegian Shortsightedness

THE position of the radio amateur in Norway is aptly described in the following letter from the secretary of the Norsk Radio-Amatorklub of Christiania to the editor of the "British Wireless World":

"The membership of the club is very rapidly increasing, showing the great interest taken in radio in Norway, an interest which has been concealed under the government ban on amateur wireless, but which is now at last coming into its own.

"Our plan is to collect the necessary number of members and then make the government a proposal that amateur work be permitted under certain conditions. Rules have been worked out by our committee and will accompany our proposal as a base for further considerations from both sides. In this way we hope to get rid of the absurd prohibition of amateur work.

"In the meantime we propose to hold lectures and demonstrations so as to arouse still more interest in this most fascinating science."

Fifty-two issues for \$6.00. Sub. Department, Radio World, 1493 Broadway, N. Y. C.

SELLS MORE RADIO WORLDS THAN ANY OTHER RADIO PUBLICATION

Times Building, New York City, June 9, 1922.

RADIO WORLD, 1493 Broadway, New York City.

It may interest you to know that of all the radio publications handled on our stand in the Times Building, more copies of RADIO WORLD are sold by us each month than of any other radio publication.

Yours truly,

(Signed) David J. Farley, Times Bldg., Newstand.

The Radio Colyum

THIS colyum is open to all amateur "contribs," and herewith takes its proud place in the colyums of the nation's papers. Those who wish to remove from their chests anything humorous regarding radio are invited to send it here. If it measures up to our standard of literary superregeneration, it will be printed. If not, it will be broadcast to the waste basket. The only remuneration will be the honor of seeing your name and your effort in print.

A Brooklyn resident says that he had to laugh when he heard a minister broadcasting a sermon say, "I am sorry that I cannot see my vast audience," because said B. r., was taking a bath while listening in.

When your static gets erratic
And your signals come in faint
Then it's time to show the family
That you really are a saint.

The above quatrain is not printed for any other purpose than to get damped oscillation on the radio poets who may contrib verses rhyming "static" with "erratic." Some other word must be tuned in before the pome is allowed to pass.

Mr. A thought he heard burglars trying to break into his house. He threw open the window, and, like a brave man, loudly broadcast, "Who's there!" on the still night air. Mr. B answered with a decided tremolo in his loud-speaker, "It's me. I'm just attaching the other end of my antenna to your roof."

One letter from an ardent radio-motorist states that it works all right but he will give a good dinner to anyone who will teach it to let him know when the gas tank is getting low or a tire is about to bust.

We admit that it is enough to make any man cuss when, after having spent fifteen minutes tuning in a distant station and getting them clear, to have the announcer say they were signing off.

It is reported that Conan Doyle's spirits have radioed that there are horses in heaven. We were wondering what had become of them.

Our Own Broadcasting Station.

OUCH for week ending July 10, 1922.
7:02—Bedtime stories. No broadcasting is complete without 'em. They beat Castoria a mile.

7:16—Exhibition of this winter's styles for men: (a) The one-tailed tuxedo. (b) Four-foot hemp ties for profiteers.

7:25—Lecture: "Why Silk Hats Should Not Be Worn While Playing Golf."

8:05—Song: "Why Live in Despair when We Will Bury You for \$275."

Words and music by Undertakers' Trust.

8:16—Address: "How to Collect Every Fare," by a Brooklyn Street-Car Conductor

9:00—Guest at a popular hotel trying to understand what the paging bell-hop is saying.

9:30—A Democratic landslide in Pennsylvania.

9:32—Capital and labor working hand in hand.

10:10—Picture of man wondering where the Anti-Saloon League gets the coin to keep it in existence.

10:15—Picture of another man being operated on for Volstead mumps on the right hip.

—ROBERT MACKAY.

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How to construct and operate it

with

Twelve Photos and Diagrams of Sets Actually Constructed by the Author.

By

KENNETH HARKNESS

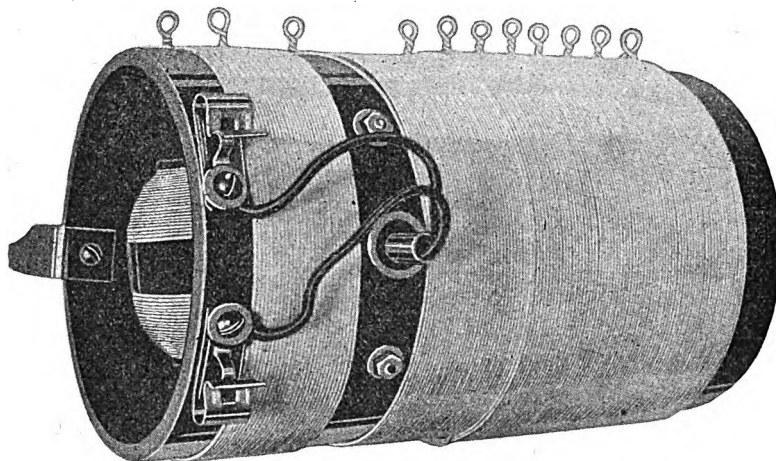
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Six months' membership in this organization costs you only \$10.00. During this period you are entitled to purchase radio apparatus thru us at distributors' prices and at a saving of from 10% to 25% to you. Buying in large quantities makes this possible. You will save MORE than your membership fee on your first \$100 order. ENCLOSE YOUR CHECK FOR SIX MONTHS' MEMBERSHIP FEE WITH YOUR FIRST ORDER.

MEMBERSHIP IN THIS SYNDICATE ENTITLES YOU TO RADIO APPARATUS AT THE FOLLOWING PRICES AND DISCOUNTS

RECEIVING SETS

	List	Discount
NORTH STAR, regenerative. Complete with the following equipment: 1 Tube; 1 pair Kellogg phones; 1 PROTEX ANTENNA PLUG; 1 "B" Battery.....	\$75.00	35%
STAR, PATENTED, regenerative, with Brandes phones.....	50.00	40%
MAN DAY, two circuit.....	38.00	40%
MAN DAY, CRYSTAL, complete ready to install.....	35.00	40%
HARKO SENIOR, non-regenerative.....	20.00	40%
LAWSAM BABY CRYSTAL, complete ready to install.....	25.00	35%

AMPLIFIERS

NORTH STAR, two stage with jack control.....	50.00	35%
MAN DAY, two stage with jack control.....	58.00	40%
CROSLEY, two stage.....	25.00	40%

PARTS

N-1 Vario-Coupler, 3½" mahogany rotor.....	4.50	50%
N-2 Vario-Coupler, 3¾" mahogany rotor.....	5.50	50%
N-3 Variometer, mahogany Stator; 3½" rotor.....	5.00	50%
N-4 Variometer, mahogany Stator; 3¾" rotor.....	6.00	50%
N-5 Variable 11 plate condenser.....	3.50	40%
N-6 Variable 23 plate condenser.....	4.00	40%
N-7 Variable 36 plate condenser.....	4.25	40%
N-8 Variable 43 plate condenser.....	4.50	40%
N-9 Rheostats.....	1.25	40%
N-10 Sockets—1 tube.....	.75	40%
N-11 Unbreakable Dials, 3".....	.75	40%
N-12 Unbreakable Dials, 3½".....	1.00	40%
N-13 BRACH lightning arresters.....	2.50	40%
N-14 Phone plugs.....	1.75	40%
N-15 PROTEX ANTENNA PLUG (supersedes aerial).....	2.00	40%
N-16 Headphones, standard make, 2200 ohm.....	8.00	50%
N-17 Double slide tuningcoil.....	4.00	40%
N-18 Detector Tubes (tested).....	5.00	30%
N-19 Amplifier Tubes (tested).....	6.50	30%
N-20 B Batteries, all makes and sizes, 50% off.		

MANY OTHER ITEMS

ALL OF THE ABOVE MATERIAL ABSOLUTELY GUARANTEED

IF YOU DESIRE SAMPLES OF ANY OF THE ABOVE MATERIAL KINDLY ENCLOSE YOUR CHECK FOR LIST PRICE OF EACH ARTICLE. WHEN YOU PLACE AN ORDER FOR A QUANTITY OF MATERIAL WE WILL CREDIT YOU WITH REGULAR DISCOUNT ON SAMPLE ORDER.

OUR GUARANTEE

We guarantee to save you at least \$100 on each \$1,000 worth of goods you order thru us or will cheerfully refund your membership fee.

Radio Manufacturers' Distributing Syndicate

508 Lincoln Bank Bldg.

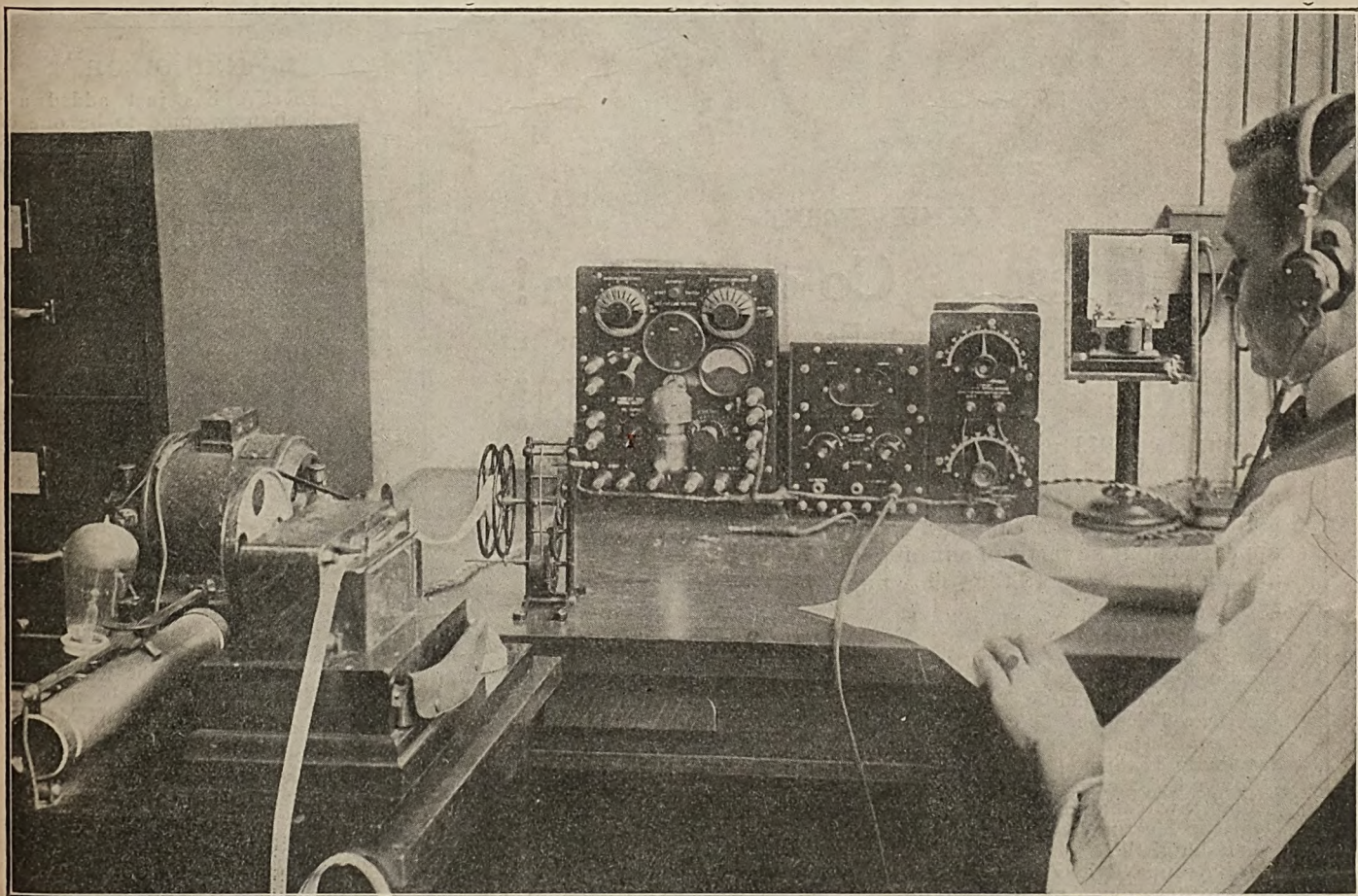
Minneapolis, Minnesota, U. S. A.

RADIO WORLD

Entered as second-class matter, March 28, 1922, at the post office at New York City, New York, under the act of March 3, 1879.

I L L U S T R A T E D

Checking Naval Radio Messages



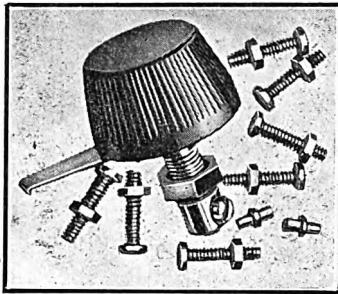
(C. Harris & Ewing, Washington, From Paul Thompson, N. Y.)

Interior of one of the remote-control stations of the United States Navy. This photograph shows no machinery for transmission—only the tape machine on the extreme left. Through local distance-wires dots and dashes are carried into the radio room of a distant transmitting-station. By means of necessary switches the operator can start the machine, which, in turn, broadcasts the messages. By this method all broadcast matter is checked up.

WHEN YOUR "MOVIES" COME BY RADIO

See
Page 4

INDUCTANCE SWITCH

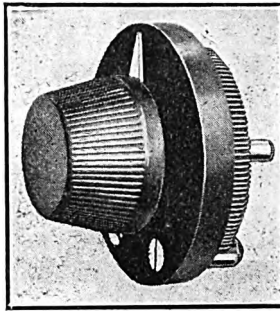


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Contact Points and Stops, 50c.

6 Ohms, 1½ Amp.

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\$1.00 per square ft. F. O. B. St. Louis
Immediate Shipment

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Write for Free Catalog.

Good territory open for live distributors.

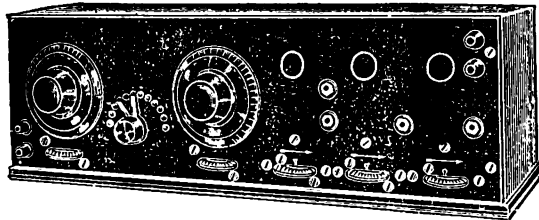
The Radio Guild, Inc.

Phone Longacre 10279
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PROGRESS SURROUNDS RADIO TO-DAY

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You Have An Opportunity to Become a Co-operator in the

NORRIS RADIO CORPORATION

which, since 1913, under the name of the Norris Electric Specialties Co., has produced standard electrical equipment and radio apparatus. We are now expanding in radio to enable us to produce standard equipment, and our special radio patents (one of which appears in our advertisement on page 27 of this issue). We number among our customers the following:

U. S. Government
Western Electric
General Electric
Westinghouse
New York Telephone & Telegraph
American Telephone & Telegraph
Chicago Edison
Sao Paulo Tramway Light &
Power Co., Brazil
Kellogg Switchboard & Supply Co.
Domestic Heating & Lighting Co.,
Galesburg, Ill.
Third Avenue Railway Co.
Northwestern Electric Equipment Co.

U. S. Navy
Interborough Rapid Transit Co.
Brooklyn Rapid Transit Co.
New York Edison Co.
Pennsylvania Railroad
New York Central
Western Union
Postal Telegraph
Radio Supply Co., of California
W. C. Teas Co., Chattanooga, Tenn.
Reliance Electric Co., Norfolk, Va.
Electric Appliance Co., Chicago
Commercial Electric Supply Co.,
St. Louis

WRITE PLAINLY

To NORRIS RADIO CORPORATION,
126 Liberty Street, New York City, N. Y.
I would appreciate information on Norris Co-
operative plans. Also your latest publication,
"The Transmitter."

Name
Address
City State
Occupation

For a limited period, we offer
investors participation in our
plans for expansion.

Radio enthusiasts who know
radio as it is and will be, com-
municate with our secretary.

Amateurs, Start Training!

THE radio art owes a great deal to the American amateur. He has made valuable contributions to the science. He is an ambitious worker who takes a very serious interest in everything he does, says "The Evening Mail Radio Review," New York.

In the past, American amateurs have paid particular attention to their transmitting outfits. To most of them, their receivers were a sort of necessary evil. Transmitting was their special hobby, and as a result of this interest long distance receiving records and the development of receiving circuits have been greatly neglected.

Radio is a twoended proposition. The most powerful and efficient radio transmitter would amount to nothing unless the receiver used to intercept its impulses were sensitive and selective. Sending efficiency depends largely upon receiving efficiency. In fact the development of sensitive receivers is more important than the perfection of transmitters. Ultra-sensitive receivers will make it possible to transmit over long distances by the use of very small power, and this in turn means small and inexpensive transmitting stations.

Following the line of reasoning, it would seem more logical for our American amateurs to devote their time to the perfection of radio receivers. This is especially true when we consider the international aspect of the radio situation. Before long a large number of radio broadcasting stations will be operating in England and other places on the continent. Our amateurs would do well to start training for the important work that is ahead of them.

"Radiotron"

AMERICA has just added a word which may come to be one of the most potent, in what it connotes, of all the new words in the English tongue. The scientific parents of the bit of apparatus to which this new name was given at one time had about decided to christen it "pliotron." Some of the neighbors called it a "triode valve," others just a plain "electron tube." But at last the name "radiotron" was compounded, and so the tube of copper and glass was named after both "radio" and "electron," as godfather and godmother of the prodigy. One would like to find in the "tron" a memory of an old dialect English and Scotch word, now obsolete, "tron" or "trone," meaning a trench or a trough; for is not this tube a trench of radiant but noiseless energy? At any rate, here is a new word, "native-born of foreign parentage."

And now even the young Russian physical chemist who, coming out of Petrograd, said to a representative of *The Times* at Reval a year ago that Russia did not know what had been going on in the scientific world for four years, and that he himself, in his field, did not know "what LANGMUIR was doing in Schenectady"—now even he will soon know it. And if this number of *The Times* reaches the Technical Institute in Petrograd, not only may the few students who are left in its laboratories be able to learn of the latest achievements in wireless, but they will know that some day, and perhaps soon, it will probably be possible for their teacher to talk directly by telephone with LANGMUIR or MARCONI.

Latest broadcasting map 15c. That is, a complete broadcasting map appeared in *Radio World*, No. 8, dated May 20. Mailed on receipt of 15c. *Radio World* Company, 1493 Broadway, N. Y. C.
Subscribe for RADIO WORLD. \$6.00 a year, \$3.00 six months, \$1.50 three months.

RADIO WORLD

[Copyright, 1922, by Radio World Co., New York, N. Y.]

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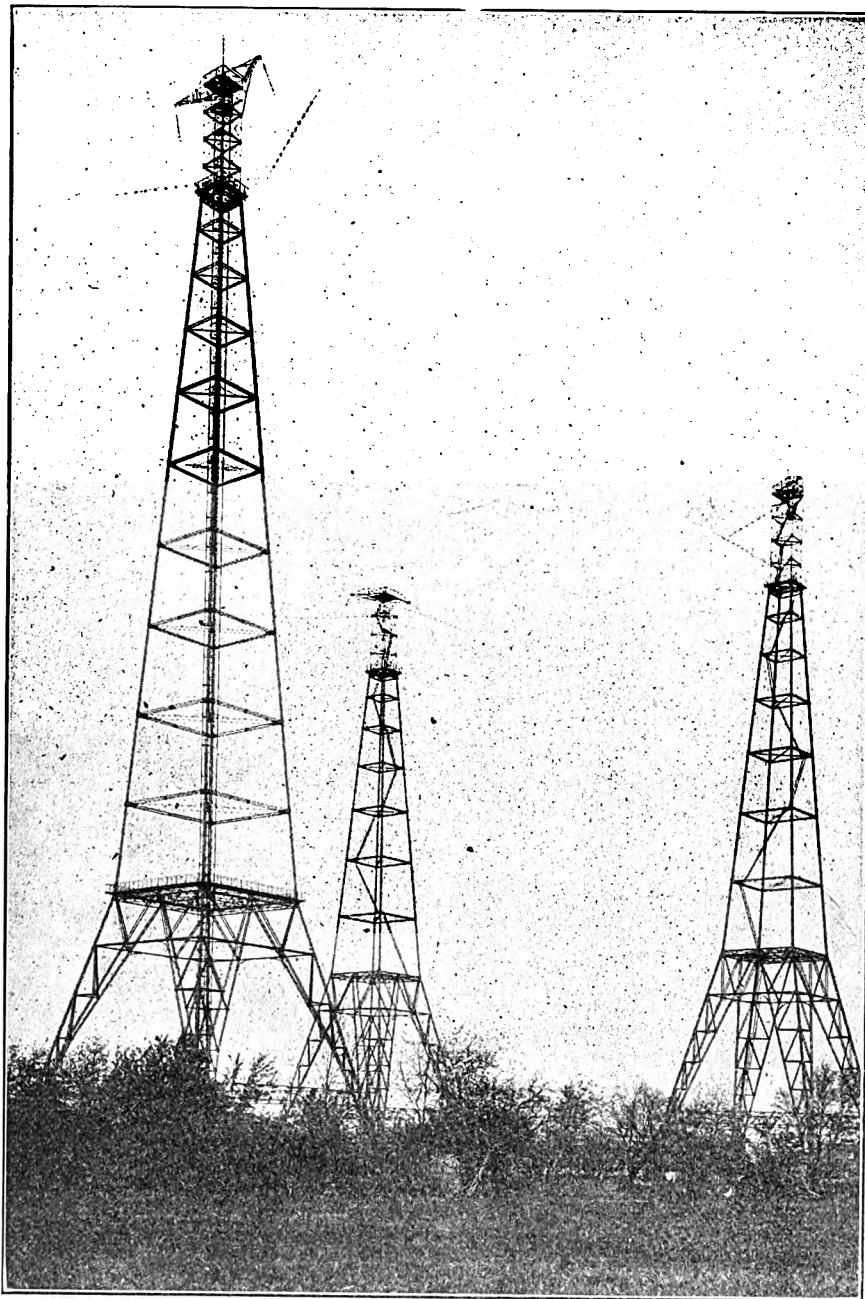
Vol. 1, No. 17

July 22, 1922

15c. per copy, \$6.00 a year

Etched Against the Sky, These Huge Aerials Give a Sense of the Infinite

These high-flung, picturesque, powerful aerials of the United States Navy, erected on the long stretch of lowlands circumjacent to Arlington, Virginia, truly give one a sense of the infinite as he gazes upward at them—the same sense that church spires often fail to bring, that many a church service does not. A sense of the wonderful future is in these wires, too; a feeling that we are on the threshold of stranger things than either philosophy or physics ever dreamed of. These massive wires are operated by the United States Navy. Whatever radio throws



(C. Harris & Ewing, Washington. From Paul Thompson.)

broadcast it is possible for them to hold. They can fling sound as far as any other transmitting medium on earth. They were built strong and durable. They are to inhale and breathe the radio messages of the world until they can be supplanted by simpler, better devices. But let us not consider their usefulness so much as their beauty and inspiration. Certainly nothing else in the world today can give a greater thrill or bespeak in more perfect mechanism the greatest wonder and mystery of creation—a wonder and mystery that is slowly unfolding to the greater light.

IT is evident that radio is going to prove one of the greatest crime deterrents ever known. Heretofore, it has always been impossible for the law, or the inventor, to get very far ahead of the criminal—the crook has generally managed to outwit every device that was pitted against him. Already, radio has shown that it is difficult for the criminal to escape from its far-reaching tentacles that penetrate every nook and every cor-

Radio Will Get 'Em

ner of the earth at all hours of the day or night. The criminal has no time for sleep, no time to collect his senses, no time to feel safe or that the law is not at his heels. Even if he should escape to the faraway and apparent safety of the sunny isles of the South Pacific—even there will radio rout him out. Our late news this week records the cable of

Commissioner of Police Enright, from London, regarding radio fingerprints. This remarkable system is being perfected in Copenhagen. As a means of identification it will save days in time and untold expense. Already a number of escaping miscreants have been captured because of radio. One who imagined himself safe—having gone in a direction opposite to that of his pursuers—was so surprised by radio interception that he gave up.

When Your "Movies" Come by Radio

By Stanley Bryant

WHEN M. Belin, an eminent French radio physicist, in 1920, succeeded in transmitting the facsimile signature of General Pershing from this country to Paris, and in 1921 when the same experimenter took a forward step by sending a photograph of President Harding by radio over 1,800 miles of the Atlantic Ocean, the events were of considerable newspaper importance; but their value to commercial art was negligible.

The Belin process is necessarily complicated. It is a combination of the chemical (photographic,) mechanical, and electrical. First the photograph is taken and a special gelatine print made from the negative. The gelatine print like a bas-relief is wrapped around a cylinder resembling, to a great extent, the revolving cylinder of the old-time phonograph. A sensitive needle is adjusted to rest lighting on the gelatine print; then as the cylinder and print are rotated, the needle moves up and down as it strikes the peaks and valleys of the bas-relief. These movements are transmitted over a radio, as dots and dashes. At the further end, a similar machine in perfect synchronism draws a record of the same dots and dashes on a photosensitive strip of paper.

But now comes an American inventor, C. Francis Jenkins, with a mechanism which not only transmits photographs by radio but, according to the inventor, will transmit motion-pictures just as easily and well.

The secret of Mr. Jenkins's device is an ingenious glass prism which, although perfectly conceived in the inventor's brain, could not be tried out in actual practice until a machine could be perfected to grind the intricate lens surfaces.

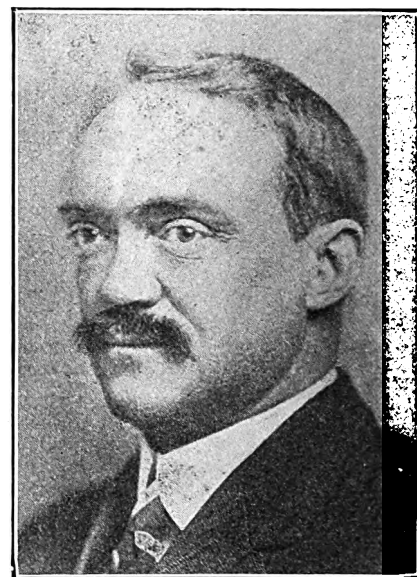
Suppose that a bar of optical glass, about 3 feet long, 1 inch wide and $\frac{1}{2}$ an inch thick were ground with a bevel on both sides at one end and in the opposite direction at the other end.

Then suppose that the surfaces between these two ends were ground so that the change from one prism to the other was gradual. Finally, suppose the finished glass rod were bent around the outer edge of a flat disc of glass or metal. The result would be a Jenkins prism, one foot in diameter.

Now, if the prism were rotated and a light beam projected through the prism the image on the screen would oscillate up and down. It is this feature that is incorporated in the new tele-transmission of photographs.

For the sake of clearness the transmission of a simple photograph will be described first. From that point on, the sending of motion pictures becomes merely a problem of securing the necessary speed in order to accommodate the succession of picture images, which, in the case of the movies, move at the rate of 16 a second.

When Mr. Jenkins wishes to send a picture by radio, the picture is placed before the rotating prisms and brightly illuminated. Two of the prisms are



C. FRANCIS JENKINS

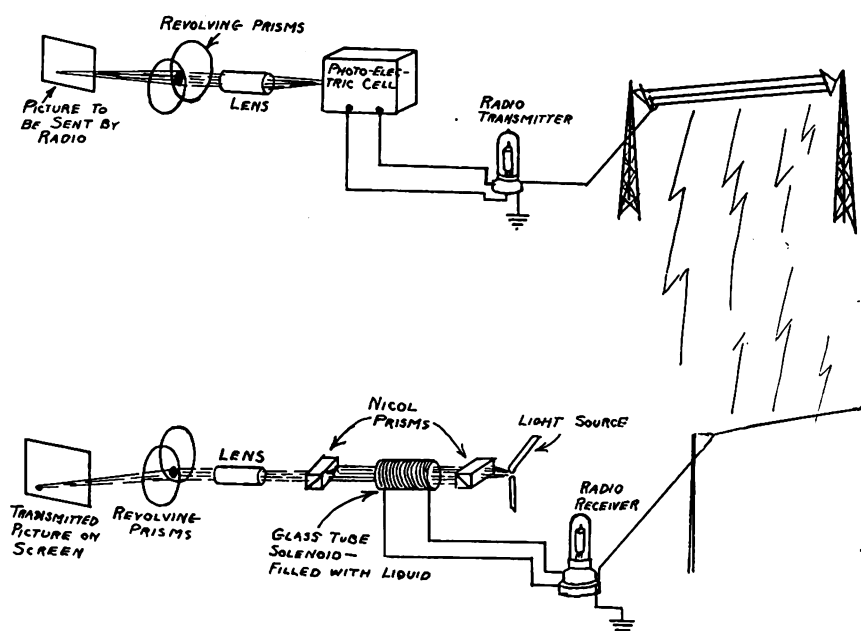
American inventor of the new device for transmitting photographs and moving pictures by radio waves.

set in front of the photograph. One of the prisms runs a hundred times faster than the other, and is also so positioned that whereas the first prism would make the image pass from the top of the screen to the bottom the other would give it a side-to-side motion. Thus when the two prisms rotate together at their widely differing speeds, the effect is the same as if the photograph were partitioned off into a hundred narrow strips.

As the prisms pick up each spot comprising the separate strips, the amount of light reflected from that spot is projected onto a selenium or other photoelectric cell. These cells have the strange power of varying their electrical resistance according to the amount of light falling on them. When the cells are in darkness their resistance becomes in the order of millions of ohms, but brilliant sunlight will cause them to become very good conductors of electric currents.

The light reflected from each spot on the photograph allows a certain quantity of current to flow through the photoelectric cell and from there into a vacuum tube where the impulses set up radio-frequency currents which, in turn, are sent out onto the aerial to the receiving station. That is all there is to the transmission of photographs by the Jenkins system.

At the receiving end, the radio impulses, like any radio message, are first tuned to resonance and then converted to audio frequency by a vacuum tube. Then they are conducted to a glass tube containing a



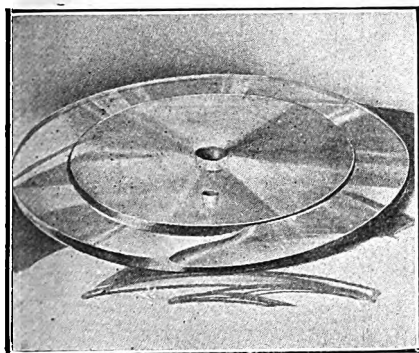
Schematic diagram showing the operation of the invention of C. Francis Jenkins which not only transmits photographs by radio but, the inventor claims, will transmit motion-pictures as well. Follow the course of the diagram from the upper left-hand corner to the right, downward, and then left to the lower left-hand corner.

(Continued from preceding page)

secret chemical, said to be carbon bisulphide, and wound with many turns of fine magnet-wire. The radio impulses cause a magnetic field of varying strength to be set up within this chemical core-solenoid.

Near the receiving instrument is a powerful arc-light producing a beam of light of great intensity. This beam of light is projected through a piece of iceland spar which polarizes the light waves. A light ray is said to be polarized when its vibrations take place only in one direction—at right angles—to the axis of travel of the ray. But if this polarized light is again passed through a second piece of iceland spar, no light whatever will succeed in passing through the combination.

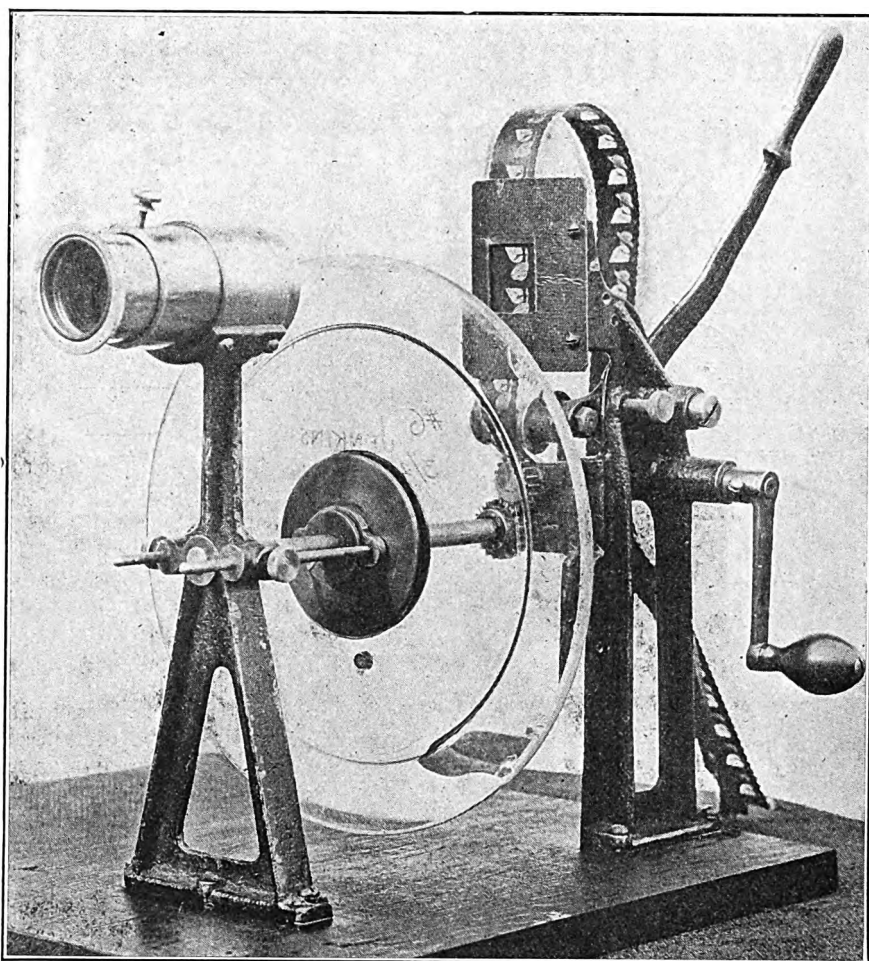
Seventy-seven years ago, Michael Faraday discovered that if a beam of polarized light is sent through a transparent substance through which lines of magnetic force are passing, the effect on the light beam is the same as if the first piece of iceland spar had been slightly twisted.



Glass prism with which Mr. Jenkins is able to transmit photographs by radio. Note the peculiar OG curve in the foreground where the two prisms of different shapes form a junction.

The finest details of the Jenkins method have never been made public, but it is believed that he makes use of the reaction between polarizer, carbon bisulphide, and an analyzer. The light from the arc lamp is sent through the polarizer and then into the chemical solution. Through the latter, magnetic lines of force produced by the radio impulses are constantly passing. The impulses varying with the amount of light reflected from a given spot or spots on the photograph at the transmitting station, are always changing the magnetic field, thus the effect on the polarized beam of light is always changing in unison.

When there is no magnetic field, no light reaches the sensitive paper waiting to receive the transmitted photograph. But when an impulse arrives a certain amount of light passes through the second spar crystal or analyzer. After passing this crystal it is directed to its proper place on the



Apparatus to be used by the inventor to convert the high lights and shadows of motion pictures into electric waves for transmission by radio. In the illustration, one of the two circular glass-discs has been removed. The cylinder at the upper left is the lens. The motion-picture film is seen at upper right.

the picture by two rotating glass prisms exactly similar to those used at the transmitting station. In this way the light intensity, whether it be a shadow, high light, or half tone, is exactly reproduced at the receiving station.

Mr. Jenkins has already been successful in sending photographs by radio. By altering the design of the transmitting and receiving prisms—so that there are 8 or 10 complete prisms during one circumference of the disc—he believes that it will be as simple to transmit the 16 pictures a second, required in motion-picture work, as it is to send a solitary photograph with his present apparatus.

This is not the time or place to discuss the wonderful possibilities of the invention. With its perfection, motion

pictures in the home would be certain to come. Every radiophone station would have an attachment by which the two persons conversing could see before them, in a mirror or on a screen, a perfect likeness of the other. Motion-picture firms who are now called on to send a duplicate print of a film picture to a city several hundred miles away, will invoke the Jenkins radio "movie" to send the entire strip of pictures through the air. But this is only conjecture. The real possibility can be foreseen by no man. It is doubtful if the inventor himself, farseeing as he has shown himself to be in perfecting the prisms and polarizing apparatus, dares to predict what his revolutionizing invention will mean to the general public—perhaps, a few years hence.

One-Wire Aerial Better than Two

NOTWITHSTANDING the fact that RADIO WORLD has published a number of important articles on the construction of the aerial, letters still continue to come to the editors asking if two wires, each fifty feet long, will give the same result as one wire 100 feet long. The answer is, emphatically, NO! The beginner should take this

warning and erect his aerial about 100 feet long, one wire, and in a straight line. Be careful to take the lead-in from the end only. If taken from the center only one-half of the aerial will be in use. In most cases the lead-in is taken from the end. But always write us if you are in trouble. We take pleasure in helping our readers.

Underlying Principles of the Vacuum Tube

By George W. May, R. E.

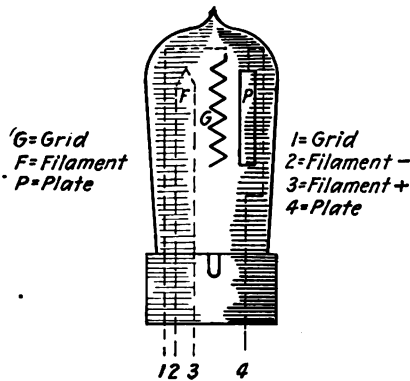


Figure 1—Diagram showing the elements of the vacuum tube which makes long-distance radio possible. Suggested by G. W. May. Drawn by S. Newman.

IN studying the underlying principles of the vacuum tube, we must deal first with the smaller elements such as matter, molecule, and the atom. Matter is divided into molecules. Molecules are divided into atoms, while atoms consist of a nucleus and a definite number of negative charges of electricity surrounding it. Matter is composed of molecules and atoms. The molecule may consist of a number of atoms, still the atom is assumed to be the smallest quantity of an element that can exist. The atom may be divided into corpuscles or particles termed "electrons." The electron is the smallest part of an element known, carrying the smallest known charge of negative electricity. Molecules and atoms have definite weight and mass, according to the substance of which they are a part. The electron is the same, no matter from what substance it is obtained. Electrons are grouped about a central nucleus having a positive charge and are in constant motion or vibration around a central nucleus. So long as none of the electrons is thrown off or detached in any way, the molecule is said to be neutral or normal. But when the electrons can be thrown off, the atom left is said to be positively charged and is termed a positive ion. In other words, a negative charge is an atom containing an excess or superabundance of electrons, while the positive charge is an atom containing a lesser, or a deficiency, of the electron.

Electrons tend to flow from a higher level; that is, from a superabundance or a negatively charged atom to one containing a deficiency or positively charged atom. An electron is about one-eighteenth-hundredth part of an

atom of hydrogen, the smallest of chemical atoms known.

The electrons surrounding the central nucleus are constantly vibrating, or whirling, around an orbit. They are attracted to the center by the positive charged center, but are kept apart from one another an equal distance, due to all being negatively charged. The more electrons in an atom the greater the activity and wider the orbit.

An atom may be decomposed by two or more well-known ways: first, by x-ray; second, by heating. Heating of the filament, in a tube, to incandescence will cause ions to be thrown into space. The vacuum tube is not a perfect vacuum, but as near perfect as possible.

The tube forms a very high resistance due to no conducting gases. If gases remained in the tube, they would become ionized by the heat and difference of potential between two elements of the tube. The ionized gases form a good conductor, but if gases were allowed to remain in the tube they would move about in certain ways, causing a disturbance of the electrons thrown off the filament. Therefore, there would be no sure calculations. Ionization is said to be the action of decomposing, or breaking up, of an atom into electrons and ions or positively and negatively charged bodies.

Conductivity is that property to conduct or allow electrons or electricity to pass freely through it, while retentivity is that property of matter which retains or holds whatever it may possess. Now, to understand the action of a tube, it is necessary to remember the following facts:

A current of electricity is simply a flow of electrons, the electrons flowing in one direction which makes a current which is said, then, to flow in an opposite direction. Electrons, then, are small charges of negative electricity. Most all material contains electrons which travel at a high rate of speed. If any air, or gas, is present, the electrons strike the minute particles of the air, or gas, about and are soon stopped. There are two kinds of electricity: namely, positive and negative. Like poles repel while unlike poles attract. These facts must be understood fully if the action of the tube is to be clearly realized.

The tube has three elements, better known as grid, plate, and filament. The grid is a fine-wire mesh usually placed between the plate and the fila-

ment of the tube. The plate is solid, sometimes corrugated, and is the first thing that the eye sees when looking through a tube. The filament lies in the inner of the tube and is usually a tungsten or carbon wire so constructed that when heated it can be distinctly seen.

In the accompanying sketch, the mark F is heated so that it becomes red or white hot. This is usually done by an electric current furnished by a battery. The battery is about six volts. In the tube we put a potential (positive) on the plate in order to produce a difference of potential. We also place a negative charge on the filament, thus producing a difference of potential between the plate and filament. We then can cause electrons to be thrown off the filament in two ways: that is, increase the flow of

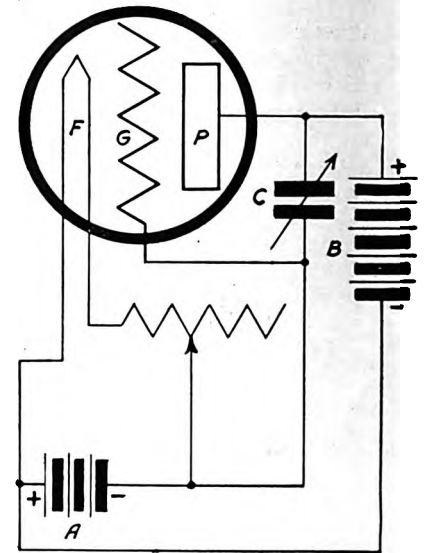


Figure 2—Schematic diagram showing the laboratory connections of the tube with the correct batteries needed. Note the variable condenser across grid and plate circuit. Suggested by G. W. May. Drawn by S. Newman.

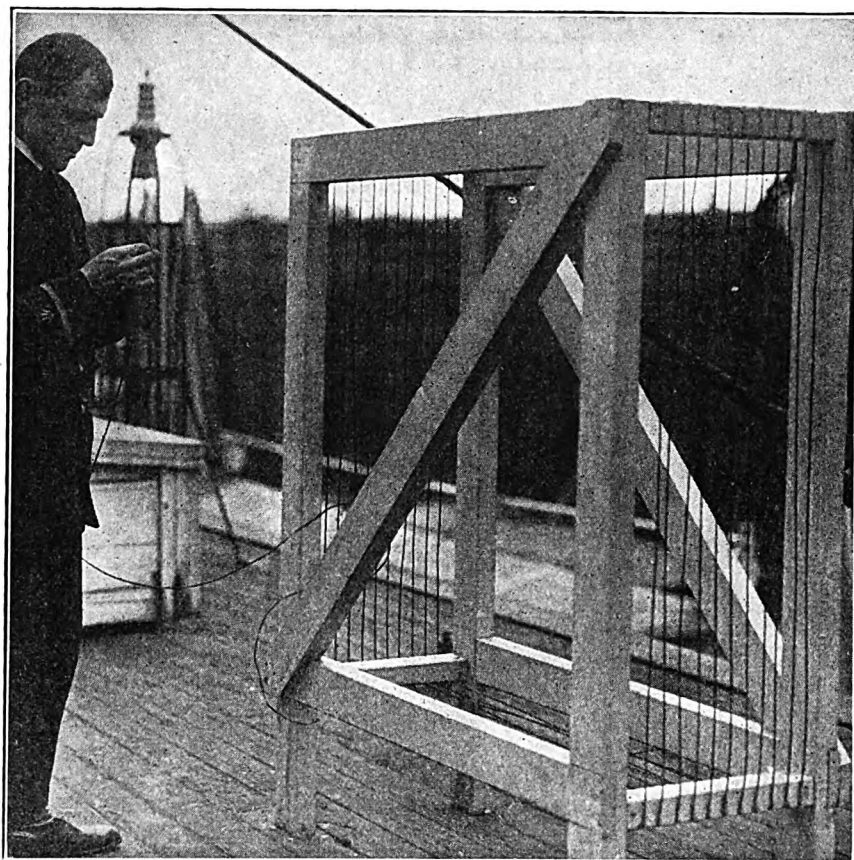
electrons from filament to plate. The first way is to increase heating the filament by allowing more current to flow in the filament circuit. This circuit is termed the A circuit. The second way is to increase the potential between the plate and filament, by increasing the B battery voltage. This method is termed the B battery circuit. By inserting the third element in the tube called the grid, we further effect the flow of electrons due to any potential we may put on the grid. The grid potential, therefore, is first positive and then negative, or alternating in character.

The grid first assists and then retards the flow of electrons, depending on the polarity charge received from the antenna. A positive charge on the grid increases the density of the electrostatic field between the filament and plate, while a negative charge reduces the density. Suppose that the filament

High-Tension Lead-in of the "America"



(C. Kadel & Herbert News Service.)



When the steamer "America" was some hundred miles off the United States Coast, it was possible to hear passengers aboard her talk to land by radiophone. The "America" is equipped with the most modern radiophone sets of any steamship afloat. In fact, it is the only ship which actually has radiophone equipment through which one may talk to a person on shore while the steamer is in mid-ocean. The reason that this vessel can be heard at such a great distance is due to the fact that loop aeri- als are employed. With the aid of this type of aerial it is possible for the operator to weed out the interference from other stations. The photograph on the right shows the loop aerial which is used for the reception of long-distance telephony; and, on the left, is the high-tension lead-in used to carry the high power to the aeri- als.

(Continued from preceding page)
is hot and the grid and plate are connected to outside circuits. Then the electrons are thrown off the filament and strike both the grid and plate. These acquire a negative charge, as they have acquired electrons. The space inside the tube has, also, a negative charge as the space is filled with electrons. As poles repel, so the negative charge on the plate, the negative charge on the grid, and the negatively charged space inside the tube are all repelling electrons, while the hot filament is trying to throw them off. As each electron is thrown off the filament it adds its charge either to the plate, grid, or space. The stronger charge causes a stronger repulsion of the escaping electrons. In a very short time, the repulsion is strong enough to prevent the escape of any more electrons from the filament.

It may be seen easily that if the plate is negative, nothing will work as the poles are all negatively charged. If the plate could be supplied externally by a positive charge, or voltage, then, perhaps, something could be done. Evidently something does happen; be-

cause when the plate is charged positively, we have a negative filament and

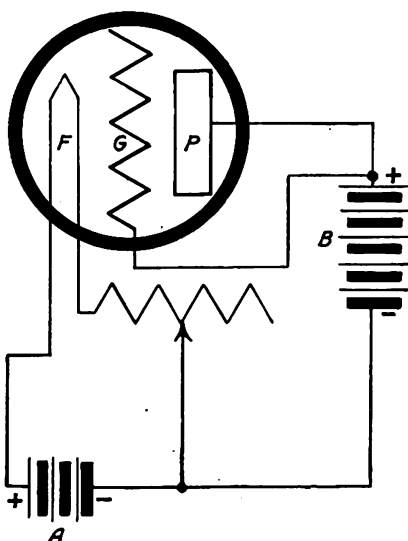


Figure 3—Schematic diagram similar to Figure 2. The difference is that the grid of the tube is connected with the plate circuit. This renders the plate and grid positively charged. This would tend to make a negative filament with grid and plate positive. Suggested by G. W. May. Drawn by S. Newman.

a positive plate. Thus the combination of the heated filament, and the vacuum, and the positively charged plate have caused a current to flow—completed the circuit which contains an external voltage known as a B battery.

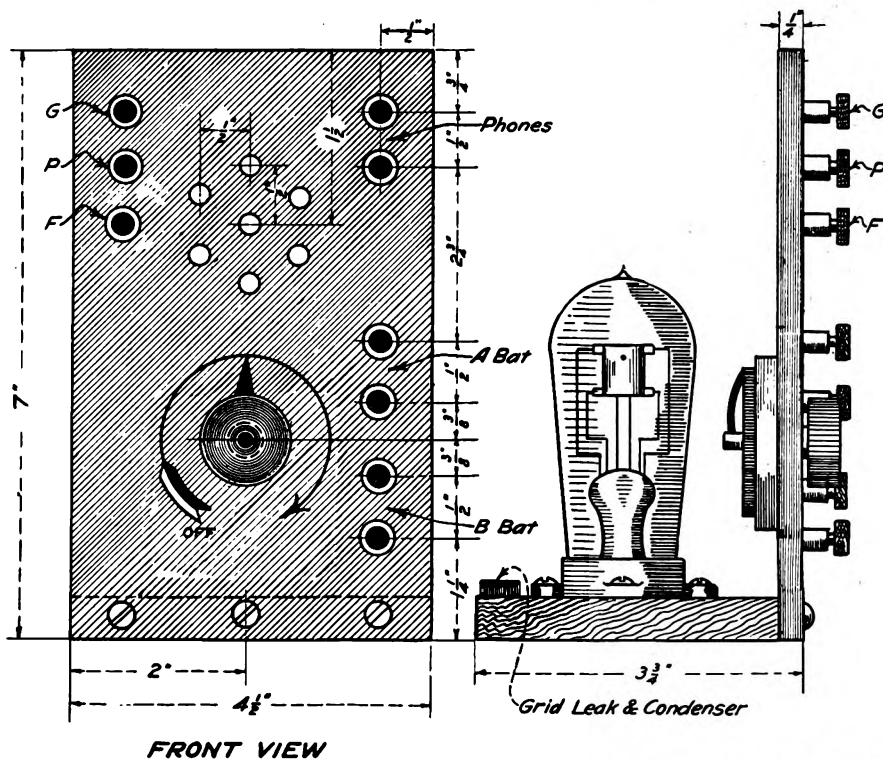
A current flows in the tube because the filament emits electrons. The electrons pass from the filament to the plate and grid. Neither the plate nor the grid can emit electrons, as they are not heated. This means that electrons can pass only in one direction through the tube. This allows the current to pass also.

This is exactly what happens with the crystal detector. A vacuum tube with filament and plate may be used in place of a crystal detector. Such a tube may be used also as a rectifier of alternating currents.

The use of the grid when employed in a vacuum tube impresses the action of the tube which has a tendency to rectify, oscillate and amplify. The vacuum tube with the three elements employed is in use, to-day, the world over, and is the finest instrument ever invented so far as radio is concerned.

Practical V-T Detector Control Panel

By Frederick J. Rumford,
E.E., A.M. A.I.E.E.



Figures 1 and 2 show the front panel and side view of the control panel. All the necessary dimensions are carefully indicated, giving the position of binding posts and rheostat. Suggested by Frederick J. Rumford. Drawn by S. Newman.

I AM presenting, in this article, a description and designs for conducting a practical vacuum-tube detector control-panel. In designing this panel, I have endeavored to take the following facts into consideration, namely: *space occupied by the panel; efficiency; and, most important to the average beginner, cost.* It should be good news to learn that this panel can be made up at a cost of less than five dollars. It is very compact and efficient. It is also constructed along unit lines, meaning that, at any time, an amateur wishing to connect either a one- or two-stage amplifier in conjunction with this panel in unit form may do so at a slight additional cost.

There is another advantage in regard to this panel: the wiring, parts, etc., are at all times accessible for changing the tube or renewing a worn-out part. The necessary parts and their respective costs are listed below:

1 panel 4x7x 3/4, either formica or celeron	\$.75
1 rheostat	1.00
1 vacuum-tube socket .....	.75
1 grid leak and grid condenser.....	.50

9 binding posts	@ 5c.	.45
Wire, screws and accessories .....		.50
Total cost		\$3.95

Of course, a builder may have to

pay a little more for some of the above items. It all depends on where they are purchased.

First, a panel of the above size is marked off and drilled as shown in Figure 1. The panel is then rubbed with No. 0 sandpaper and oil, which will give it a dull finish; but should the builder desire, he may leave the finish just as he bought it. Next mount the binding posts and rheostat.

The builder should now purchase a piece of soft wood of the following dimensions: 4 inches long, 3 3/4 inches wide, and 1/2 inch thick. He may give this two coats of good shellac. When dry, he should mount his panel on it, as shown in Figure 2 by means of the three small wood-screws. The grid leak and the grid condenser can be mounted on the base at the back of the V-T socket, as also shown in Figure 2. This is done by means of two small wood-screws. The vacuum-tube socket should be mounted, also, on the base.

The panel is now ready for the internal wiring of the hook-up. This should be done with No. 14 covered wire, and should be run as straight as possible. Be careful not to have any kinks in the wire. It would be advisable for the builder to solder small copper terminals on the ends of the wire, which will easily fit over the binding-post screws. This makes a cleaner and more positive connection at the respective posts or connections. Care must be taken that the high-voltage battery, or what is better known as the B battery, does not get in contact with the vacuum-tube filament. If such a thing should occur, it would be the finish of the tube. This would necessitate the purchase of a new tube, or the repair of the burnt-out one, which is almost as bad so far as the financial end is concerned.

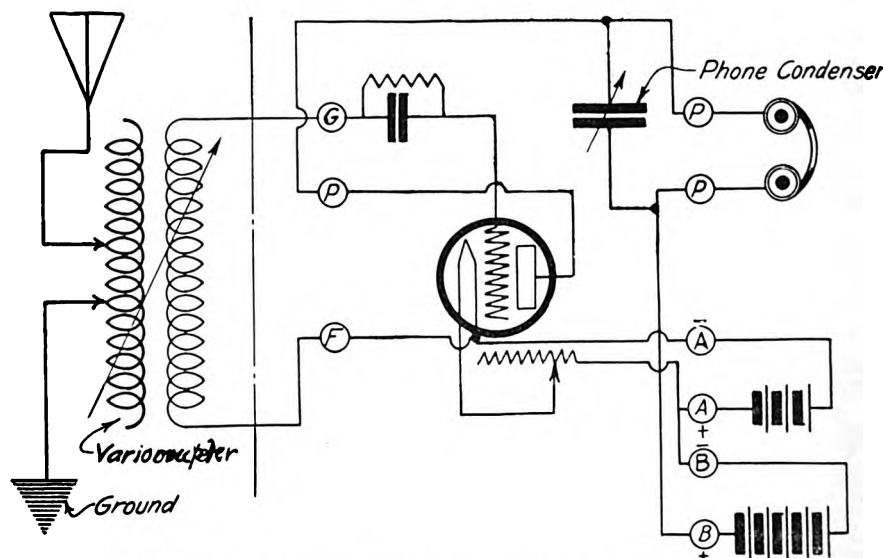


Figure 3—Schematic diagram showing the necessary wiring of the detector and control panel. Suggested by Frederick J. Rumford. Drawn by S. Newman.

First Words Heard by Wireless

ON Sunday, February 15, 1880, Dr. Alexander Graham Bell received the first words ever spoken over a wireless phone. The words spoken and received were heralded by a flash of light through his laboratory window, writes Donald Wilhelm in "Radio Broadcast." Then he distinctly heard, he told me: "Mr. Bell, Mr. Bell, if you hear me, come to the window and wave your hat!"

The man who spoke these words was Charles Sumner Taintor. He was on the top of the Franklin School, Thirteenth and K street, N. W., Washington. Mr. Bell was in his laboratory on L street, between Thirteenth and Fourteenth, on the north side of the street.

The instrument devised by Dr. Bell, by which for the first time in history words were transmitted beyond the power of the human voice and without the use of wires, might have been called a light-phone, was at both the Louisiana Purchase Exposition and the World's Fair displayed as the radiophone, and without question projected speech on electro magnetic waves, though not, of course, by means of high frequencies or a modern tuned circuit.

(Continued from preceding page)

Figure 3 shows the proper external connections of this panel assembled in conjunction with the variocoupler—which I described fully in RADIO WORLD No. 5, dated April 29; but, of course, there are many other hook-ups that may be used in conjunction with this panel.

In conjunction with this variocoupler, I have heard WGI at Medford Hillside, Mass., also WBZ, Springfield, Mass., and KDKA, Pittsburgh.

The radiotron tube used with this particular panel was a U-V 200, which requires a plate voltage ranging from 18 volts to 22½ volts, being variable by means of a variable B battery, or in series with a small potentiometer. The lighting filament requires a voltage ranging from four to six volts, having a battery rheostat in series, which is shown on the panel.

I advise the builder to purchase a storage battery with a six-volt power, either forty or sixty amperes, as using four dry cells, wired in series, is an expensive proposition as they burn out or run down pretty fast. This means the purchase of additional dry batteries; whereas, when a storage battery runs low, it may be charged easily at a small cost. Better still, if you have house current in your home, by purchasing a few lamps you can make a bank and you can charge the battery yourself. The initial cost of the battery may seem large, but to any one intending to keep his radiophone in constant use, it is really the best buy in the end.

This above covers practically everything necessary to build this panel. Any one following my directions should meet with no difficulties.

The Radio Will Find a Way



—From "The Evening Mail" Radio Review.

The Lightning Fallacy

TO the general public wireless and lightning seem to be twin brothers, probably because the manifestations of both are somewhat mysterious. Hoisting a radio antenna over one's property is the safest precaution that can be undertaken, whether it is to be used for radio or as a lightning rod. An aerial acts in a way similar to a lightning rod applied to a church steeple, a tower, or a building. Here the rod, or aerial, is used for protection; but because we use it for radio reception, it at once becomes dangerous! This is positively ridiculous.

During a heavy electrical storm why doesn't a heavy steel bridge collapse? Why doesn't the ocean greyhounds turn to splintered steel? Simple because they are properly grounded! It is a fact that their foundation is in the ground—having a metallic structure. Once the lightning strikes a metallic

structure, this metallic structure, being a conductor, passes the lightning safely to the ground.

This same principle applies to the aerial on your home. Study lightning, if you will, before you install a radio set. We all know that most metals are conductors of electricity. It is electricity that we must deal with.

Suppose your home is of wood, stone, or brick, and is not equipped with an aerial for radio. But next door to you is a home that is equipped with an aerial for radio. During the night a heavy electrical storm occurs, and both homes are under the terrific barrage of the storm. Which is the safest home in which to seek shelter? Naturally, and without a question, the home equipped with the aerial. Why? For the simple reason that if the strays from the lightning come in your direction, the house with the aerial would pick up these strays and absorb them.

The Radio Primer

The beginner who follows regularly this department in **RADIO WORLD** will secure a liberal education in the applied principles of radio science

Radio World's Revised Radio Dictionary

By Fred. Chas. Eblert

Galena (Crystal)—Native lead sulphate occurring in cubic, or octahedral, crystals or in a mass. It is the chief ore of lead, and, frequently, contains enough silver to rank as silver ore. It is the best-known rectifier used in a radio crystal receiving-set. It is bluish gray with metallic luster and shows highly perfect cubic cleavage.

Henry—The unit of inductance. When one volt of pressure is required to make a change of one ampere in one second of time, that circuit is said to have inductance of one henry.

Harmonics—When C-W, or undamped waves, are employed, harmonics, as they are called, refer to the incidental waves most noticeable when receiving with this method of C-W. These harmonics differ in wave length and frequency. At times, amateurs will hear the harmonic from some high-power long-distance stations while their sets are set for shorter waves.

Hertzian Waves—Electromagnetic waves named for the German discoverer, Professor Herman Hertz, in 1887. These waves are the basis which made radio possible.

Heterodyne—A method of detecting received oscillations in such a manner,

usually undamped, so as to cause them to interact with other locally produced sustained oscillations of slightly different frequency, and generally built up of greater amplitude. The heat, or resultant note, is the difference between the frequencies of the two independent oscillations.

Head phones—The detector, or receiver, which makes it possible to hear signals, speech, or other sounds. Telephone receivers used for radio reception are of the double watch-case type, having a band which fits over the head. The resistance usually employed is from 1,500 to 3,000 ohms to each case.

High-Frequency Currents—This term is used when several thousand or more oscillations take place in a second of time.

Hook-up—A schematic diagram showing the wiring of any receiving or transmitting station. Diagrams of this kind make use of certain symbols which represent the various pieces of apparatus.

Hysteresis—In an electromagnetic circuit, when a change of condition takes place, we encounter a slowness or lagging behind. This is hysteresis.

The Beginner's Catechism

By Edward Linwood

WHAT does the variable condenser do in a circuit?

The variable condenser supplies an electrical quantity called capacity. Radio circuits are made up of capacity and inductance. Tuning coils supply much of the inductance while the condensers are depended upon to supply the capacity. Perhaps a clearer idea of capacity could be gathered if a condenser were to be considered as a miniature storage-battery which catches and holds the minute electrical impulses until they are sufficient to make impression in the head-phones.

* * *

What decreases the range of a station in connection with aerials? Has the insulation of the antenna any effect on the range of the station?

If the insulation of a receiving aerial is poor, the range of the station is reduced considerably. Time after time, amateurs request more data on what

they could do to increase their range. This insulation is an important factor, and should be inspected occasionally.

* * *

What kind of aerial is best for receiving station?

This depends on the location and erection of the station desired. If the amateur is located more than fifty miles from any broadcasting station, he should not attempt to receive with anything less than an outdoor aerial con-

The Radio Primer has been published regularly in **RADIO WORLD** since issue No. 1, and will be a regular department in order to instruct and aid the many thousands of amateurs who are joining the ranks of radio enthusiasts every week.

sisting of one copper wire, 100 or more feet in length. An indoor aerial may be considered if the amateur is located within fifty miles of a broadcasting station and he intends to install an outfit with one or more stages of amplification.

* * *

Why is the one-wire aerial preferred?

Because it eliminates much of the static. Most amateurs are concerned in the broadcasts which are sent out, with few exceptions, on a 360-meter wave-length. The one-wire aerial is preferred because it responds to such short wave-lengths.

* * *

What is the operation of a crystal detector? What makes it a rectifier?

Numerous minerals such as galena, silicon, bornite, zincite, carborundum, and others have been found to possess the property of rectification of high-frequency oscillations. The ordinary crystals are not suitable for long distances, because no means are provided for amplifying signals after they have been rectified. By using these crystals in series with the head phones, they will permit the current to flow in one direction only; that is, the incoming oscillations may have their positive or negative currents cut off which will operate the phones with a pulsating current (direct), which makes the incoming signal audible.

* * *

How could one test out a variable condenser to see if it is shortened?

The variable condenser consists of two sets of plates, one movable and one stationary. Connect in series with this condenser, a buzzer and battery. Revolve, or turn, the set of movable plates very slowly. If shortened there will be a buzz. The spot should be noticed in the condenser where the "short" is. By using a jackknife the plate shortened may be widened so as to prevent a short circuit when using it in a set.

The Growth of Radio Uses

By Harold Day

STARTLING developments have resulted in the application of radiotelephony to the practical problems of everyday existence. Various news despatches have testified to its utility in direct communication between a ship and a business office, in the detection of crime, broadcasting of market reports, and expediting official business. While the interest in radio broadcasting has in no way abated—in fact, it is increasing at greater and greater speed—it is encouraging to note that believers in the practical uses of radio are becoming increasingly justified in their faith. Thousands, today, are equipping their homes with radio receiving sets.

Radio World's Hall of Fame



(C. Harris & Ewing, Washington. From Paul Thompson, N. Y.)

Dr. S. W. STRATTON

Uncle Sam's Right Arm of Radio

Dr. S. W. Stratton, director of the United States Bureau of Standards, the clearing house of radio in America, and chairman of the Radio Technical Conference Committee, appointed by Herbert R. Hoover, Secretary of Commerce, to formulate a national radio policy. Dr. Stratton suggested constructive modifications for present radio laws to improve on those passed in 1913. He maintains that private property rights never can be maintained in the ether. He is the chairman of the new interdepartmental conference just called by Secretary Hoover (see page 22 of this issue of *Radio World*). The Bureau of Standards, of which he is the head, is responsible for all governmental radio work. Notable development and improvements have been made by this department in all branches of radio. It has designed various radio devices now used throughout the world, including most everything from amateur sets to the intricate and powerful transmitting sets used in both branches of the national service.

How Uncle Sam Proposes to Control Irrigation by Radio

By Carl Hawes Butman

WASHINGTON, D. C.—Radio control of an irrigation project comprising some 200,000 acres of reclaimed land in Arizona, is the latest use to which overworked radio has been put by the government. The Salt River Valley Water Users' Association, which is a local agency controlling the Salt River Irrigation Project, for the Interior Department, has installed and equipped a radio house toward the source of the Verde River, its natural water supply. There is no railroad or means of communication between Phoenix, Arizona, and the upper reaches of the river where sudden storms cause the ordinarily low water to rise with great rapidity, frequently flooding the ranches and farms below and causing enormous damage.

Believing that a radio service would provide a timely warning, the operators of the project have taken up the latest means of quick and direct communication, and received the approval of Secretary Fall of the Interior De-

partment. Gauges are placed in the upper Verde and also at Cave Creek, so that any appreciable rise can be noted and broadcast from the station to the manager's office in Phoenix and to all ranch owners who listen in.

There is also another phase of usefulness to the credit of the new radio station. When the Verde River, which flows into the Salt River, near Phoenix, is supplying plenty of water only a little is used from the reservoir back of the big Roosevelt Dam. In the future, the inlet from the reservoir will be controlled by telephone from Phoenix, based on reports from the radio station as to the state of the water in the Verde. When the storage water is not needed, or the radio station advises the operator at Phoenix that rain is falling in the Verde basin, the inlet to the system from the Roosevelt Dam will be closed and nature will take care of the irrigation, but when the Verde is low, the inlet at the dam will be opened by telephone orders

from Phoenix. This control will conserve considerable of the valuable storage supply for emergencies.

Some estimate of the project and its value may be realized when it is known that, in this territory, practically built up since 1900, 196,350 acres are cropped annually out of a total acreage of 205,060, and that the crops in 1920 were valued at \$18,551,800. The land included in the Salt River Project comprises 4,200 farms with a population of 31,600, includes 14 towns with 57 schools, 62 churches and 20 banks. During the past two decades, the section has been transformed from an arid territory into a high state of cultivation. Its banks have gained \$22,927,767 in deposits since 1920.

In the past, there have been some bad years, when the water was short, but with the new radio control and communication it is believed that the water can be so conserved as to insure a steady and lasting supply.

Another branch of the Interior Department, the Bureau of Mines, is seriously considering the problem of equipping mines with radio apparatus for use in the event of a cave-in or other accident. The stringing of wires for an ordinary telephone service is impossible, but officials state that it would be fairly simple to equip certain distant rooms or chambers with crystal receiving sets so that rescue parties may communicate with imprisoned miners. The real problem, they say, is to find a simple and portable transmitting set by which the miners may communicate with the mouth of the mine or the outside world, in the event of being injured in or imprisoned after an accident. There is no room for a large transmitting set, they point out, and the danger of a transmitting spark igniting gases or coal dust complicates the problem, although a tube set might be used if the necessary power could be supplied for its operation without lengthy power-wires which would be in constant danger of being cut, just as telephone lines would be cut or broken by the mining operations. Mining engineers are studying the problem. It is possible that a means of efficient operation will be found before long.

Another scheme which is appealing to the safety branch of the Bureau is the installation of a broadcasting set at each mine to advise the safety squads and first-aid man of accident, so they may start, without delay, for the scene with their equipment.

Radio Has Reached India



(C. Kadel & Herbert News Service.)

Radio has taken a foothold in India. The big British possession in the East has put the new science to some important uses, following in the footsteps of other countries. Here is a photograph of Prince Ranjitsinhji, one of the richest men of his country—famous as a cricketer, and one of the first of his countrymen to be graduated from Oxford—seated by a Marconi Wireless Telegraph car, transmitting to his friend, the Marajah of Kutch. This radio-equipped car travels from place to place, daily, and its arrival means that he who has a radio message to send may stop it—broadcast a signal—transmit the message—and pay the price. What could be simpler?

Importance of Aerials to Radiation

By C. White

THE sole purpose of an aerial is to radiate, or dispense, electromagnetic waves. Such a function cannot be performed unless we have some method of changing our ordinary dynamic, or power, electricity into magnetic waves. The average student in electricity knows that when a current is established in a wire an electromagnetic field is immediately set up in the space surrounding it; but so soon as this current reached a steady state in the wire the electromagnetic waves also cease to move. Therefore, to keep a wire in a continual state of radiation we must have a continually alternating current within the same; meaning that we must apply an alternating electromotive force to the radiating system.

Another way to visualize this action of the antenna is to consider the same as a small condenser which is alternately charged and discharged by the applied electromotive force, and, of course, with each charge and discharge there is a flow of current in the connecting wire, or wires, which, in turn, sets up the traveling magnetic-waves.

The actual amount of current and, hence, the amount of electromagnetic energy radiated depends on the frequency of the source. More power is radiated at high frequencies than low, because the actual amount and change in the charging, or aerial current, is correspondingly larger. Many amateurs and radio experimentors are accustomed to look on an aerial as having a certain fictitious resistance, called the radiation resistance, and the power radiated by a network is equal to this resistance multiplied by the square of the charging current.

There are many types of aerials now in use, depending largely on the type of service required and the type of equipment in the station. A few of these types are: The single vertical-wire, the inverted L, the T, the fan, the umbrella, the loop, and the multiple-tuned types. I shall outline the characteristics and advantages of each type.

* * *

A single vertical-wire hanging in a plane perpendicular to the ground, forms a fairly good aerial radiating or receiving radiated energy equally from all points. This aerial is very undirectional and its sole disadvantage lies in the fact that, in order to obtain sufficient length of wire, great height must be reached. It is a good temporary aerial for those who wish to operate a set in a high office-building.

* * *

The inverted-L type aerial consists of a horizontal leg of the L composed of one or more wires and the vertical leg, which is known as "lead

in." This aerial is claimed by some to be very directional, but the relative amount of "directionality" may be said to depend on the relative length of the horizontal leg as compared with the "lead in"; when the former is very long, compared with the latter, the aerial is claimed to receive stations better that lie along a line pointing from the open end of the horizontal section towards the "lead in." This type is used by the Marconi Company, and is a favorite with amateurs. But I would advise all to remember that a long horizontal leg of single wire is far better than a short leg of multiple parallel wires, although the total amount of wire used is the same.

* * *

The T type is essentially nothing more than the inverted L with the "lead in" placed at the center to form the letter T. This aerial does not pro-

Employing Two Circuit Receivers

RADIO WORLD has received numerous complaints about interference by the commercial, naval, and amateur stations. Of course, some of the complaints are serious, but there are a great many listeners who expect too much from their receivers. If a single-circuit tuner is in use, the listener is held responsible for this, as this tuner lacks the inability to tune out unwanted stations. The single circuit has been used and worked to death. If the two-circuit tuner is applied, much of this interference can be eliminated. This is a point for the manufacturer to consider.

Dr. Steinmetz on Lightning

DR. STEINMETZ'S experiments are important. He hopes to contribute to the development of lightning arresters. Nature's bolts, it is maintained, can never be harnessed and used by man, for they come and go in an incalculable fraction of a second. But Dr. Steinmetz may discover how lightning may be rendered so harmless that the insurance companies would no longer class it as a risk.

America leads the world in many fields of radio.

—Marconi.

duce a very uniform field near the station; but, at a distance, the field is uniform due to its own corrective action. This type is not as directional as the inverted L, but is largely used on ships and with portable sets.

* * *

The fan type is so called since the wires are shaped like a fan and are in an inclined vertical plane. This antenna radiates its energy in a plane perpendicular to the sides of the wires. It is slightly directional; that is, working better with stations in line with the direction in which it is inclined. Its main disadvantage lies in the fact that great height is needed in order to get the proper radiation resistance.

* * *

The umbrella aerial is mostly used with portable field sets. It is very useful in signaling aeroplanes, since it radiates most of its waves vertically. But if the legs of the spreaders are brought very close together and the lower edge of the same comes close to the ground, practically no energy will be radiated since most of the magnetic field will then be confined to the space between the spreaders and the ground.

* * *

The loop, or coil, antenna is always pointed toward the direction in which it is desired to receive. Stations forming an angle of 15 degrees with the direction of the coil will practically offer no interference. Therefore, this aerial is decidedly directional and, due to its size and shape, it can not be satisfactorily used in large outdoor sizes. This type of aerial has recently received quite a boost because it does away with grounding, eliminating static to a marked degree; but, owing to the fact that it is relatively small as compared with the outdoor types, radio-frequency amplification is required on distant stations. Generally a variable or fixed condenser is placed in series with the loop because of the large inherent inductance of the same.

* * *

The multiple-tuned antenna is of quite recent design, and consists of a long horizontal aerial tapped to ground at different points with an inductance. The source of excitation is placed in one of the taps. The net result is that each of the vertical wires acts as a vertical antenna and the combined resistance to ground is very low since there are many multiple paths. The capacity of each horizontal section and the inductance in the grounding circuit must be tuned or in resonance; so that each vertical section is radiating its energy at the same instant.

This type of aerial is now in successful operation at the New Brunswick, New Jersey transatlantic station.

Radiograms

Latest Important News of Radio Garnered from the World Over, and Reduced to Short Wave-Lengths for the Busy Reader.

THE Marconi Yacht "Electra" picked up radio signals 3,480 miles away while at anchor in New York Harbor. She "listened in" on signals from a new French station at St. Assise, twenty-five miles South of Paris. The signals came in clear and strong.

Il Senatore and his party departed from the United States on Saturday, July 8. The "Electra" was given a warm reception as she passed out to sea. Her destination is England.

Dr. Charles P. Steinmetz has been nominated for Engineer and Surveyor of the State of New York by the Socialist and Farmer Labor Parties. The chief engineer of the General Electric Company says he is too busy, however, to conduct a campaign.

Radio messages broadcast in the name of the District Attorney of New York, to intercept the expected sea flight of Isidor Nathan, accused of a fraud amounting to \$60,000, were picked up in Albany, New York, and Nathan was captured in that city.

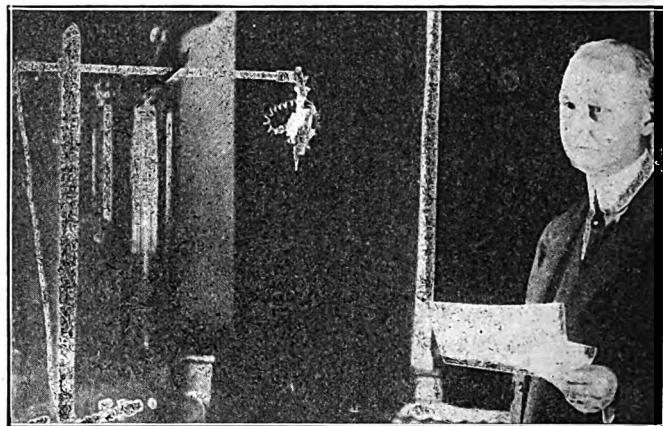
The President of the Allied Police Commission, at Constantinople, has prohibited the sale of wireless apparatus in Constantinople and in the zone of Allied military occupation. The notice permits the sale of wireless apparatus outside the zone occupied by the Allies, but requires firms wishing to make such a sale to obtain permission from the Allied Police Commission, Constantinople, before making delivery of the goods, giving the name and full particulars concerning the buyer and of the destination of their apparatus.

There is an increasing interest in Santiago, Cuba, in radio-telegraphy and radiotelephony, according to United States Consul Harold D. Clum. It is intended to install a broadcasting station powerful enough to be heard in every town in Oriente Province. The majority of receiving stations now in use have been constructed by amateurs, or assembled from parts obtained from the United States; but as American firms are oversold, much difficulty has been experienced in getting deliveries on orders placed in this country. The proximity of Cuba to the broadcasting facilities of the United States adds to the possibilities for developing a market there for radio sets.

The Naval radio station at Great Lakes began broadcasting news and weather and crop bulletins for the Department of Agriculture on June 16, handling about 3,200 words daily with a 30 k.w. arc on a wave length of 4,900 meters. A new 750-watt telephone transmitting set is being installed at the Great Lakes Station.

Not to be outdone in radio activities by the Agricultural, Post Office, Commerce and other civil departments, Secretary Davis has decided that it would be a good scheme to get the Labor Department on the radio map and tell the world what it is doing. To this end, he has officially asked the Navy Depart-

Tell It By Radio!



(C. Wide World Photos.)

Frank W. Smith, president of the National Electric Light Association, giving a lecture, by radio, on "What the Public Utilities Mean to the Public." Mr. Smith has just completed a tour of 9,000 miles, visiting the great power-companies and stations, and, in his talk by radio, he once more covered the same territory in a few minutes by voice, which required several weeks by train to travel over.

ment to aid in the broadcasting of activities relating to immigration quotas, labor arbitration, employment, and child labor, as well as other official business.

Gloucester fishermen have taken up radio with great enthusiasm. Owners of the large fleets that sail from the Massachusetts port are planning to use the radiophone for the direction of their vessels, and they hope to be able to save thousands of dollars by the direct touch with their floating outposts which radio should give them.

Radio is recognized as the logical agency for checkmating the motor-car thief, according to John Wall, president of the Kansas Branch of the Anti-Horse-Thief Association, which has become—in these changing times—the Anti-Motor-Car-Thief Association, without surrendering its honored title. Says Mr. Wall:

"If we could have radiophone communication between the various police stations in the State it would be the end of motor-car stealing. By broadcasting instantaneously the information of a theft, we would have every sheriff and peace officer in the State looking for the thieves. I believe the plan has great possibilities and I am going to try and develop it."

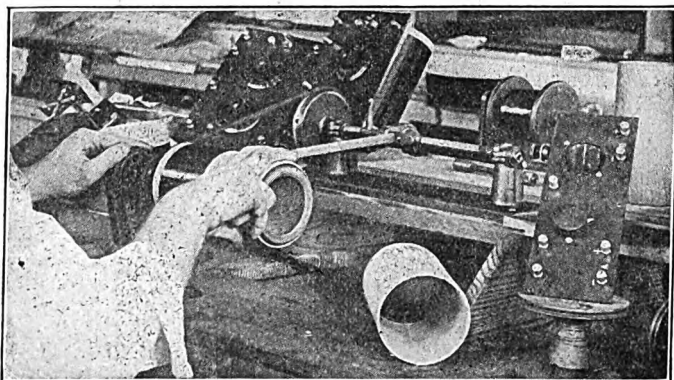
The fifteen radio stations maintained by the Postoffice Department in connection with the operation of the air mail service will probably be changed gradually to provide both radio telegraph and radio telephone service, according to an announcement by Postmaster General Work. The Washington station has had both radio telegraph and radio telephone service for nine months.

In addition to maintaining an hour to hour record of the progress of the airplanes carrying mail the Postoffice Department stations now send out complete weather reports, data concerning grain, dairy, and livestock.

Radio and the telephone engaged in a race, and radio won. The event took place on the Pacific Coast, under the auspices of the United States Shipping Board. The contest was to determine which was the most efficient and cheaper method of communication between coast ports. Radio tolls were 40 per cent less, and it was found to be the speediest by long odds.

British radio fans now receive one concert a week. Twenty-five minutes is the duration of the program. But in spite of this, people are buying receiving sets madly. A report states that radio interest is sweeping through the country like a forest fire.

"Close Up" of a Radio Winder



(C. Kadel & Herbert News Service.)

Most every radio fan would like to visit a factory where radio sets are made and assembled, but few have the opportunity. Here is a "close-up" of a winding machine by means of which coils used in radio sets are wired.

Radio and the Woman *By Crystal D. Tector*

A WOMAN claims, that through radio, she may have discovered the source of life. Mrs. Maud Dickinson, the British scientist, of Brighton, England, states that she has unearthed a certain "minute something," resembling, in form, a "self-created" scarab, or beetle, of ancient Egypt, the properties of which are as marvelous as any that the Egyptians attributed to their chief amulet. It forms crystals outside and away from the bottle in which it is contained. If these crystals are placed in a sealed test tube and the tube is dipped in water, the water acquires, it is said, inexplicable radioactive power.

* * *

This is the news cabled to "The Times," New York. It is mighty interesting. We do not know what radio may yet reveal. Its wonders are being brought to light more and more every day.

* * *

But to go into Mrs. Dickinson's discovery further: By



(C. Kadel & Herbert News Service).

Mrs. August Belmont, formerly Eleanor Robson, actress, who served with the Red Cross in the French, British and American Lines' Hospitals, gave a talk by radio on the "Work of the American Red Cross." Mrs. Belmont is a member of the Central and Executive Committees and is considered one of the most brilliant speakers in America

means of it composite bodies are reduced to their elements. Flint becomes fine powder. Pain is alleviated. It is even asserted that gold can be made.

The "Daily Express," London, says that a Brighton corporation is using one of Mrs. Dickinson's radioactive cylinders with complete success to clear hot water pipes in their baths of incrustations. Mrs. Dickinson, who is a member of the Royal Institution, when asked how she made her discovery, is quoted as saying.

"I was experimenting with oils for the purpose of making perfume and scenting soaps. I noticed on a paper at the top of the water, some small crystal whose presence I could not understand. I took them to chemists in London, and on their suggestion, I fused them, using an ordinary Bunsen burner. There was an alarming and unexpected explosion, which happily did no damage. When it was over I found this fine white crystal like a diamond, and also a particle or vegetable, which I have since found to be the scarab.

"It puzzled me altogether when I examined it under the microscope because of the rays it was emitting and I placed it in a bottle. When this bottle is laid in the sunlight the scarab throws off through the air and through the glass minute crystals which I use."

* * *

Mrs. Dickinson says the scarab has moved since she placed it in the bottle eight years ago. She says it is not an insect, and she believes it to be vegetable life. "Perhaps," she added, "it is the source of all life."

* * *

Verily, the wonders of radio have only begun.

* * *

Did you hear Helen Westley broadcast the work of the Theatre Guild? It was a clear, distinct piece of work. Miss Westley "radios" well. And her story was most interesting.

* * *

I liked, also, "What Paris Is Wearing at the Races." It not only gave us the latest styles, but a lot of French atmosphere as well. These fashion talks, by radio, are most interesting to us women. I know many with receiving sets who tune in on this particular bit of broadcasting whenever it is announced.

* * *

Well, I am off to the woods for a month. I've just finished packing up my set. We are to have a bungalow near Lake Hopatcong. I'll have some interesting radio matters to divulge from there.



(C. Kadel & Herbert News Service).

The scope of radiophone is becoming so broad that each day reveals new possibilities for its use. An interesting instance of this is revealed in connection with entertainments for the blind. Realizing this, the New York Association for the Blind installed a very fine radio receiving-set with two stages of amplification and loudspeaker at its headquarters, known as "The Light-house." The blind girls there are so enthused over it that it is not uncommon to see them walk up to the set and carefully examine it with their fingers endeavoring to learn just what makes it "take music from the air." The photograph shows a group of totally blind girls listening to a radio concert.

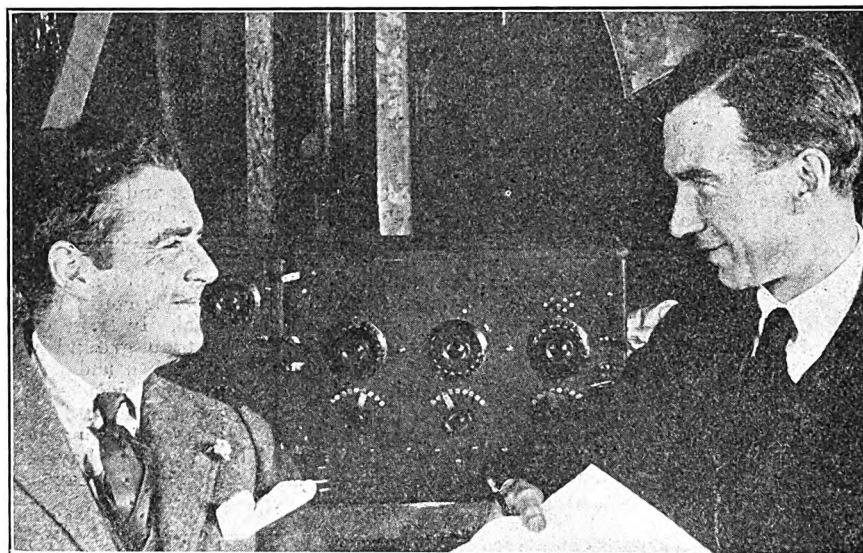
Rats Various Uses and Growing Popularity

(Right) A radio stock-ticker on ocean liners is the latest passenger necessity. A powerful transmitter has been erected on the roof of the Hotel Commodore, New York, from which stock quotations and other important market news is broadcast on a wave length of 1900 meters. Radio operator, Marshall C. Wright, photographed, is in charge.

(C. Kadel & Herbert News Service.)

(Left) Here is a striking photograph of the only woman, to date, who manages a school of radio engineering. Miss Mary T. Loomis, daughter of Dr. Mahlon Loomis, one of the pioneers of radio-telegraphy, and who had a practical working of wireless before Marconi was born, not only conducts her school at Washington, D. C., but is instructress as well.

(C. Fotograms, N. Y.)



(C. Fotograms, N. Y.)

Marshall Neilan (left) moving picture actor, and Hugh Wiley, author, are hearing something from over the Hertzian waves that sounds good.

(Left) Father Lynch, of Boston College, broadcasting a radio invitation to all police chiefs in the United States—from the station in Boston College—to attend the meeting of the International Association of Chiefs at San Francisco. S. J. Connolly, chief operator of the college, and Charles E. Duffy, second operator, are standing by.

(C. International.)

(Right) Here is a real human aerial! A new amplifier recently put out by the Marconi Instrument Company, is so sensitive that messages may be received at sea by a wire wound around the operator's body. The operator photographed is in communication with ships in the North Sea, his body acting as an aerial.

(“P. & A. Photos.”)



Answers to Readers

I HAVE a receiving-set outfit composed of a tuner made up of two variometers and one variocoupler. The balance of the outfit is composed of a detector tube and three stages of amplification. I am using a UV-200 detector—UV-201 for two stages amplification and UV-202 for the last step. I can get concerts from Pittsburgh and Schenectady very well on the two stages, but can notice no improvement by using three stages. I have 22 volts on the detector tube, and 45 volts on the rest of the tubes. What is the proper voltage and hook-up for this outfit?—Captain C. A. Durkee, Sudbury, Ontario.

The detector tube would operate better between the plate voltages of 17 and 19 volts, the next two amplifiers between 40 and 45. With the last tube, you could experiment with about 90 volts. The last step using this type tube will create quite a bit of distortion, but the proper plate-voltages should be found along with the proper tuning. * * *

Send me a hook-up for a crystal set containing a variable condenser, single-slide tuning coil, crystal detector (galena) and phones.—Thomas Kearny, Central Park, N. Y.

See RADIO WORLD, No. 11, dated June 10. "Single and Two-Slide Tuning Coils," by George W. May, R. E.

I have two steps of audio frequency and a magnavox loud-speaker. Could I obtain the same results if I change the audio to radio frequency?

Could a single wire, 250 feet long, be used for short-wave reception?

Is there a power tube for amplification, which has a filament voltage of six volts?—William Steinbuhler, Titusville, Pennsylvania.

Radio frequency may be employed, but it is merely in an experimental stage. I would suggest that you stick to your audio-frequency set unless you care to dig in and experiment.

A single wire may be used with a short-wave receiver, but a variable condenser may have to be placed in series with the antenna for reducing down to some of the shorter wave-lengths.

There is a power tube on the market. Some amateurs have found that it makes a good amplifier. * * *

What is the difference between a short-wave receiving-set and a long-wave receiving-set?

Why is it that when we get something on it it fades away, but returns only to fade away again?

Why is it that when we get a speaker on that we can hear the voice plain enough, but not sufficient to understand what is being said?—Black and Marshall, Lewisburg, Tenn.

The difference between a short- and long-wave receiver is just this difference. With the short wave, we are able only to pick up messages using wave lengths from 200 to 2500 meters, while with the long-wave receiver we can intercept messages from 2500 meters to most any wave desired. A number of people are under the impression that this short- and long-wave name pertains to distance. This is absolutely erroneous. The wave means the size of the wave in length.

"Fading" is what this is called. When receiving over long-distance—say several hundred miles—obstacles come between the transmitter and the receiver. These effects are more apparent in summer time

than in winter. Unfortunately, there is no way of avoiding this difficulty at the present time. It is what we call "radio fog." It lies in patches. Sometimes it is strong; at other times, weak. If the receiving station is in a line with this fog and the transmitting station, "fading" will be noticed. * * *

I have a regenerative set and am thinking of using 110 volts for the filament, this being taken from the lighting circuit. What I want to be sure of is whether it makes any difference which way the wires are connected to the filament; or, is there such a thing as positive and negative in A.C. current?

In a set employing a V-T detector and two stages of amplification, should I have a rheostat for each unit?—William Nissman, Dixon, Illinois.

You cannot employ a 110-volt lighting circuit with your filaments and secure results. In the first place, if a transformer is used to reduce the power, the hum obtained from the generators of the power station would be heard in the head phones. Stick to the old storage-battery.

The answer to your second question is "No." There is no positive or negative with alternating current. In using two stages, or any number of stages of amplification, always use a rheostat with each tube used. * * *

What is a counterpoise, and why used?—Stephen Ransom, Bay Shore, L. I.

A counterpoise is an artificial ground, such as a large piece of sheet metal, or a number of wires, spread out and insulated from the ground. The counterpoise is just beneath the aerial. In large commercial stations, this type ground was used in preference to the earth and it was claimed that receiving range was considerably increased. Have the counterpoise longer and larger than the copper the aerial contains. The idea is to have the aerial and counterpoise act as a capacity in the circuit.

Coming Events

The editors of RADIO WORLD will gladly publish news items of all contemplated radio shows and exhibitions. Keep us posted by mailing full information.

ANNUAL SHOW OF THE ST. LOUIS RADIO ASSOCIATION, St. Louis, Mo., October 4 to 7, inclusive.

CHICAGO RADIO SHOW, Coliseum, Chicago, Ill., October 4 to 22. U. J. Hermann, managing director, 549 McCormick Building.

INTERNATIONAL RADIO EXPOSITION, Grand Central Palace, New York, December 21 to 30.

KANSAS RADIO EXPOSITION will be held at the Kansas State Fair, Hutchinson, Kansas, September 16 to 22 inclusive. A. L. Sponsler, secretary.

MERCHANTS' COOPERATIVE ADVERTISING AGENCY RADIO SHOW, Robert Treat Hotel, Newark, N. J. Date not set. Will be held this year.

"RADIO DAY," Pittsburgh, Westview Park, August 24. Under auspices of Radio Engineering Society. C. E. Urban, secretary.

RADIO CLUB OF AMERICA. First autumn meeting will be held the last Friday in September. Renville H. McCann, secretary, Columbia University, New York.

CLEVELAND RADIO AND ELECTRICAL EXPOSITION, Cleveland Public Auditorium, Cleveland, O., August 26 to September 4, inclusive.

INTERNATIONAL RADIO CONGRESS (Radio Pageant of Progress), Municipal Pier, Chicago, August 6, 7 and 8. John F. Delaney, director of publicity, 7 West Madison St., Chicago, Ill.

KANSAS RADIO LEAGUE SHOW, Convention; W. L. Harrison, vice-president.

The Radio "Colyum"

WIFE in Washington, D. C., sues husband for divorce. Claims that he spends all his time and money on radio. Friend we told this to says: "Well, it is becoming useful isn't it?" * * *

F. P. A., remarks that Dr. Charles P. Steinmetz should poll a good many votes. He will if he stands for the American ohm. * * *

*The curfew tolls the knell of parting day,
The lowing herd winds slowly o'er the lea;
But up to date I haven't quite found out
What is the matter with my battery B.* * * *

"This business revival," says the Toledo "News-Bee," "could stand a little more shouting." Why not tell the broadcasting stations. * * *

They're all getting the fever. The markets editor of a rural paper wrote it: "Broadcast on Tomatoes" instead of "Forecast on Tomatoes." * * *

No, Rollo, "In Tune with the Infinite," by Ralph Waldo Trine, is not a book on radio. * * *

In Portland, Oregon, arrangements were made recently whereby scores of dances were conducted to the same broadcast music "On with the dance! Let radio be unconfined." * * *

Menu of a South American liner announces in the dessert column: "Radio pie with currents." Who will be the first to ask: "Were the currents picked at sea?" * * *

A fan in St. Louis recorded a radio selection upon a phonograph record and then passed it along, says the Providence, R. I., "Journal." He suggests sending it back to its place of origin by the same process. The first thing we know a fellow talking by wireless around the world will be bothered by the sound of his own voice received at the same time it is sent. And that's going some. * * *

"Former Kaiser Spends Much of His Time Reading Bible,"—headline. Too bad it couldn't have been broadcast to him eight years ago. * * *

If radio enthusiasts keep on inventing these smallest sets, we will be rushing to the Smithsonian Institute to see the prize one installed, most likely, in a mosquito's right ear. * * *

Our Own Broadcasting Station

OUCH for week beginning July 24, 1922

7:00—Grandpa's folding bed-time stories. Specially designed by the Grand Rapids Furniture Manufacturers' Amalgamation.

7:22—Very sentimental ballad: "Don't Pay Back That Dollar You Owe Me; Because I Must, Then, Lend You Five."

7:30—Lecture: "When Prohibition Comes," by William Jennings Bryan.

7:43—New York Cabaret Songs (Specially deleted for children.)

8:02—Cornet solo (unrehearsed). "The Cake Eater's Sabbath," by Houdini wearing handcuffs.

8:05—Recipes I Have Never Tried: "How to Make a Tripe Omelette without Eggs," by Kit Chenstove.

8:24—The Philadelphia lady: "Come Back Before the Scapple Gets too Cold."

8:32—Address: "Are We a Free People?" by the framers of the Volstead act.

10:00—Correct time from the Zeigfeld chorus. ROBERT MACKAY.

Makes Radio Fans of Farmers



(C. Underwood & Underwood, N. Y.)

The man in the photograph is pleased—pleased because he is doing the farmers of the United States an invaluable service. He is W. A. Wheeler, in charge of the radio service of the Department of Agriculture. He is in charge of the nation-wide radio agricultural service, which is broadcasting weather, crop and market reports to every radio receiving set in the United States.

Idaho Joins Broadcasting States

AMONG twelve broadcasting stations licensed by the Department of Commerce, during the past week, two are in Idaho, one of the five States which had no broadcasting station. They are operated by an electric shop in Moscow and a firm in Lewiston. Wyoming will soon be in the broadcasting field, it is reported, and then there will be but three States without radio stations—Mississippi, Kentucky, and Delaware.

Los Angeles appears to be pretty near the saturation point so far as radio broadcasting is concerned. With twenty-nine stations in its vicinity contributing to the aerial barrage of news, music, and entertainment, time schedules and wave assignments will be necessary soon.

The newly licensed stations include:

KFAR—O. K. Olsen, Hollywood, Calif.

KFBA—Ramey & Bryant, Lewiston, Idaho.

WHAG—University of Cincinnati, Ohio.

WHAH—J. T. Griffin, Joplin, Missouri.

WHAJ—Radio Equipment & Mfg. Co., Davenport, Iowa.

WHAJ—Bluefield Daily Telegraph, West Virginia.

WHAK—Roberts Hardware Co., Clarksburg, W. Va.

WHAL—Phillips, Jeffrey and Derby, Lansing, Mich.

KFAN—Electric Shop, Moscow, Idaho.

KFAP—Standard Publishing Co., Butte, Mont.

KFAX—City of San Jose, Calif.

WHAM—School of Music, Rochester University, New York.

(Applied)—Galveston Tribune, Texas.

Newspaper Broadcasters of the United States

Daily News Printing Co., Canton, O.
 Detroit News, Michigan.
 Examiner Printing Co., San Francisco.
 Fort Worth Record, Texas.
 Sacramento Bee, California.
 New Orleans Item, Louisiana.
 Los Angeles Times, California.
 Seattle Post Intelligencer, Washington.
 Minnesota Tribune Co., Minneapolis.
 Oregonian Publishing Co., Portland.
 Palladium Printing Co., Richmond, Ind.
 Post Despatch, St. Louis, Mo.
 Register and Tribune, Des Moines, Ia.
 Ridgewood Times, New York.
 Rochester Times Union, New York.
 Atlanta Journal, Georgia.
 Atlanta Constitution, Georgia.
 Herald Publishing Co., Modesto, California.
 Los Angeles Examiner, California.
 Modesto Evening News, California.
 Spokane Chronicle, Washington.
 Times Picayune, New Orleans, La.
 The Deseret News, Salt Lake City, Utah.
 Republican Publishing Co., Hamilton, Ohio.
 Detroit Free Press, Michigan.
 Newburgh News Print. & Pub. Co., N. Y.
 Times Despatch Pub. Co., Richmond, Va.
 Tribune Pub. Co., Oakland, Calif.

The Star Telegram, Fort Worth, Tex.
 Bakersfield Californian, California.
 Daily States Pub. Co., New Orleans.
 Pasadena Star News Pub. Co., California.
 Herald Pub. Co., Klamath Falls, Wash.
 Kansas City Star, Missouri.
 Quincy Whig Journal, Illinois.
 Quincy Herald, Illinois.
 Tampa Daily Times, Florida.
 The Tribune Inc., Great Falls, Mont.
 Arizona Daily Star, Tucson, Ariz.
 Florida Times Union, Jacksonville.
 Hartford Courant, Connecticut.
 Muskogee Daily Phoenix, Oklahoma.
 Telegram Pub. Co., Salt Lake City, Utah.
 Fresno Evening Herald, California.
 Bellingham Publishing Co., Washington.
 Star Bulletin, Honolulu, T. H.
 Baltimore American and News, Md.
 Dallas Morning News, Texas.
 Daily Drivers Journal, Chicago, Ill.
 Daily Argus-Leader, Sioux Falls, S. D.
 Houston Chronicle, Texas.
 St. Cloud Times, Minn.
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 Miami Daily Metropolis, Florida.
 Southern American, Ft. Smith, Ark.
 South Bend Tribune, Indiana.

MAGNAVOX
 Radio
The Reproducer Supreme

Radio brings it
 MAGNAVOX tells it

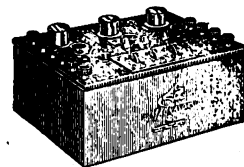
WITHIN the past few months more than half a million radio receiving sets have been installed by amateurs, mostly to hear the daily programs of Concert and Dance Music, Vaudeville, Speeches, Sermons, etc., broadcasted from central stations in all parts of the country.

It is Magnavox Radio, the reproducer supreme, which makes the receiving set wholly useful and enjoyable.

With the Magnavox Radio you hear every wireless program at its best—the city's finest musicians and entertainers at your command throughout the day and evening.

R-3 Magnavox Radio with 14-inch horn, is ideal for use in homes, offices, etc.

R-2 Magnavox Radio with 18-inch horn for those who wish the utmost in amplifying power: for large audiences, dance halls, etc.



No
 Wireless
 receiving
 set is complete
 without the
MAGNAVOX
 Radio

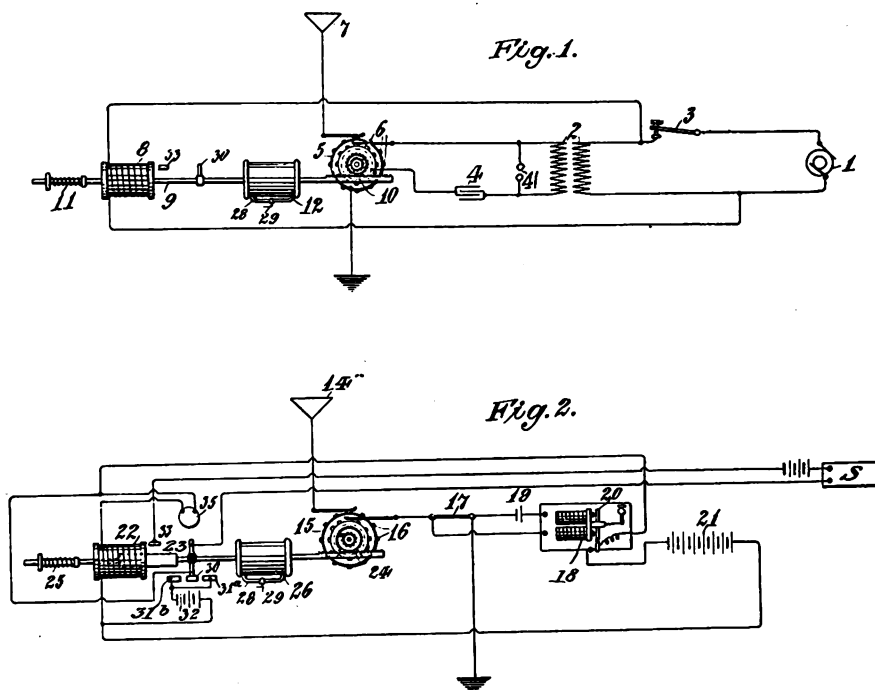
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Radio Patents

RECENTLY ISSUED



Schematic diagram illustrating the circuits of the invention of John Hays Hammond, Jr., to perfect conversation, without interference, between two stations, regardless of the number of stations on the same wave-length.

To Prevent Interference of Messages on Same Wave-Length

No. 1,420,257. Patented June 20, 1922.
Patentee: John Hays Hammond, Jr., Gloucester, Mass.

IN transmitting wireless messages interferences of different messages often occur when two independent operators send their messages by chance in the same wave length. When this occurs the message being received becomes unintelligible as the two messages become mixed together. The object of this invention is to provide means whereby a message may be sent in impulses

of different predetermined wave length succeeding each other in a predetermined order.

The receiving instrument in Mr. Hammond's invention, is arranged so that it is rendered responsive successively to the different wave lengths in the same predetermined order. In this way a message which passes between the operators is composed of elements constantly changing in wave length. Hence it becomes impossible for an operator of another instrument to interfere unless he is sending with the same system of wave lengths and order of succession.

With this system two operators may converse as in a code without interruption or interference.

Electrostatic Condenser to Prevent Rotor Accidents

No. 1,420,485. Patented, June 20, 1922.
Patentee: George F. Johnson, Springfield, Ill.

IT is a matter of common knowledge that the storage capacity of an electrostatic condenser is due, among other things, to the quality of the dielectric, that is, the specific character of the dielectric, to the extent of the space separating the adjacent plates, so that it will have a greater storage capacity the closer plates are together; and by varying the space separating the two armatures at any point, the storage capacity is increased and decreased, and the variation in capacity in a condenser is used in a wireless telegraph circuit renders the condenser unreliable in establishing and maintaining a reliable adjustment.

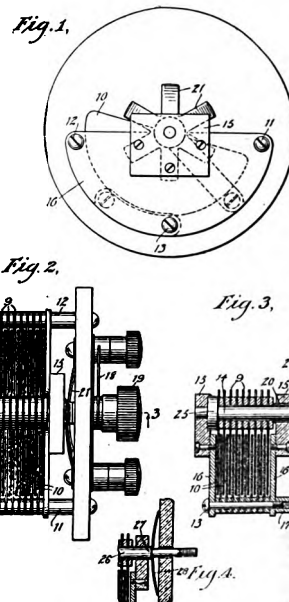
The capacity of a condenser depends on the exposed area of the two plates, or armatures, with respect to each other; by decreasing the exposed area, the storage capacity is decreased. It follows

from this that if you vary the exposed area of one plate, or armature, with respect to the other plate, or armature; or if you vary the distance between the two adjacent armatures, you change the capacity and, therefore, the adjustment. It is convenient to join two series of thin metal plates and to interleave one series of plates with respect to the other. It is common to do this by fixing one series of plates in stationary position and pivoting another series of plates, so that one series of semicircular plates interleave with another series of semicircular plates; each arrangement, one fixed and the other movable, is called an armature. The movable set is on an arbor adapted to be rotated by a handle or button on the exposed exterior. It is possible to adjust the storage capacity of a condenser by varying the extent of exposure of the surface of one armature with respect to that of the other, and it is very important to cause the movable armature to move so true and accurate that one plate never makes contact with the other and, in moving to expose more or less surface, to move without making

contact or irregular variations of distance between the adjacent surfaces of the two separate armatures."

"In my improved condenser," says Mr. Johnson, "one armature, or stator, is firmly fixed in position and the other armature, or rotor, is moved so true and accurate that there is no variation in parallelism between the interleaved plates.

The invention provides improved



Schematic diagrams of the Johnson electrostatic condenser which, when rotated, may prevent short circuits. The invention provides improved means to protect the movable rotor from accident, against any adjustment.

means for maintaining the movable or rotor, member of the condenser against accidental movement after adjustment. It also provides a condenser with a star or other shaped spring exerting frictional or elastic contact to hold the plates of the movable member, or rotor, of the condenser accurately and permanently centered with reference to the plates of the stationary member.

Radio Would Have Saved Atlantic City Express

RADIO would have saved the Atlantic City express.

"There is no excuse for the terrible loss of human life in that most recent of railroad disasters.

"Science has come to the aid of transportation. It is here, ready to serve whenever called upon, and to fail to accept its helping hand, is as close to actual criminality as any responsible official should care to approach."

The name of the man who uttered the foregoing pregnant sentences is omitted because he is a high official of one of the leading radio equipment manufacturers in America and does not wish to become embroiled in a controversy. If there comes to the reader of the statement a sufficiently energized desire to verify it, the name of this official will be given, in confidence, and he may be consulted on the subject. He went on to declare himself most emphatically on the subject, after the writer of this had suggested that radio would have saved that train and any other that was in danger from a similar cause.

"Every railroad train in America should have its radio equipment," he continued. "especially those that carry passengers. It is criminal to omit it. Its value has been proved by the lives it has saved at sea. Eugene Shade Bisbee in *The Globe*, New York.

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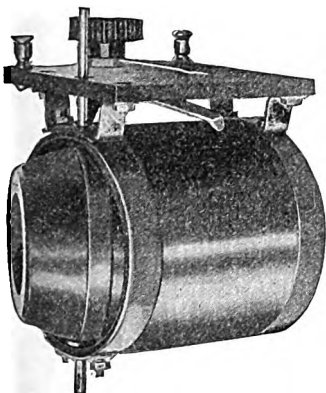
No. of Plates	M.F.D. Capacity	Assembled	Knocked-down
3	.00007	\$1.75	\$1.50
11	.00025	\$2.50	\$2.00
21	.0005	\$3.25	\$2.50
43	.001	\$3.90	\$2.90

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PUBLISHED EVERY WEDNESDAY (Dated
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their order, is automatic acknowledgment of their
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Entered as second-class matter, March 28, 1922,
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the act of March 3, 1879.

IMPORTANT NOTICE:

While every possible care is taken to state
correctly matters of fact and opinion in technical
and general writings covering the radio field, and
every line printed is gone over with a scrupulous
regard for the facts, the publisher disclaims any
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patents, priority of claims, the proper working out
of technical problems, or other matters that may be
printed in good faith and on information furnished
by those supposed to be trustworthy. This statement
is made in good faith and to save time and
controversy in matters over which the publisher
cannot possibly have control.

Talks Radio, Not Politics

THE Charleston S. C. Mail tells
of a novel political campaign being
conducted by R. B. Howell, Republican
national committeeman from Nebraska,
a candidate for Congress. The novelty
is this: Mr. Howell's speeches contain
nothing about politics and nothing
about the speaker himself. The topic
is radio.

He talks about the use of the radio on
the farm and in the isolated home, and
the farmers, their wives and their sons
and their daughters are flocking to hear
him. He interests his audience, and they
do not stop to ask if he is progressive
or reactionary, or what not. They know
he is a live man who is up-to-date, because
he talks about the most up-to-date thing
in the world to-day. Then, charmed with
the new message, so different from anything
which they have heard before, with their
imagination given free play, his auditors go
home and there is no end to what they may
picture to themselves, as to what good
will result from having in the Senate of
the United States one who is so competent,
and one who, they think, no doubt, will
in some way use his power to help them
in every way.

* * *

Electricians Must Know Radio

ELECTRICIANS, if they are to come in
contact with radio, should make a study
of radio. Of course, to merely install a
lightning switch or arrester requires no
research; but to put a radio set into perfect
operation is not so simple.

Electricians fail to grasp the fact that
radio is not a simple mechanical problem
like wiring a house yet so they do not study
it except by observation or by blind
experimenting. Yet some electricians will
advise beginners and due to their profession
are heard with confidence.

It would be well for electricians to stick
to straight electrical work until they know
something about radio from study. Then
let them go to it for all it's worth.

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New Hoover Committee to Regulate U. S. Broadcasting

AT the request of Herbert Hoover, Secretary of Commerce, each of the ten Government Departments has appointed representatives to an Interdepartment Advisory Committee on Governmental Radio Broadcasting. There are in addition representatives of the Office of the Chief Coordinator (Bureau of the Budget), and the United States Shipping Board. The membership of the committee is as follows:

Agriculture—W. A. Wheeler, Radio Development section.

Commerce—Dr. S. W. Stratton, director, Bureau of Standards.

Interior—O. P. Hood, chief mechanical engineer, Bureau of Mines.

Justice—S. Ely, chief clerk.

Labor—A. E. Cook, office of the Secretary.

Navy—Commander D. C. Bingham, Naval Communication Service.

Post Office—J. C. Edgerton, Air Mail Division.

State—W. S. Rogers, International Communications Conference.

Treasury—L. J. Heath, Public Health Service.

War—Major General G. O. Squier, Chief Signal Officer.

Chief Coordinator—Captain H. P. Per-rill, asst. coordinator, Bureau of the Budget. United States Shipping Board Emergency Fleet, corporation—F. P. Guthrie, head of radio division, Operating Department.

The chairman of the committee is Dr. S. W. Stratton; secretary, Dr. J. H. Del-linger, chief of the Radio Laboratory, Bureau of Standards, Department of Commerce.

In accordance with recommendations of the committee, an experimental system of government broadcasting by "primary" broadcast stations has been established, utilizing only previously existing government stations and equipment. The "primary" stations are stations which broadcast official government news by continuous-wave (code) telegraphy for the purpose of furnishing this information to local broadcast stations for rebroadcasting, by radiophone. The eight stations thus far included send out daily bulletins of government news, mostly agricultural market data. They are: Arlington, Va., (Navy, 5950 meters); Great Lakes, Ill., (Navy, 4900 meters); Washington, D. C., (Post Office, 1980 meters); Omaha, Nebr., (Post Office, 2500 meters); North Platte, Nebr., (Post Office, 4000 meters); Rock Springs, Wyo., (Post Office 3000 meters); Elko, Nev., (Post Office, 3000 meters); Reno, Nev., (Post Office, 3200 meters).

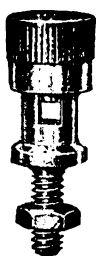
The committee has made a preliminary classification of the kinds of material

which the several departments may have to broadcast by the primary stations, viz:—market prices and data, weather and hydrographic news, standard radio-signals—such as wave length and time signals—executive announcements, statistics, and educational material. One of the functions of the committee is to advise regarding priority of the types of Government material to be broadcasted and regarding schedule of operation.

The committee has recognized the principle that radio must be used primarily for types of service that can not be as satisfactorily given by other means of communication, and that, therefore, radio broadcasting should not be used in general where wire telegraphy or telephony, or printed publication, would be as satisfactory. It is possible that the scope of the committee's activities may be extended beyond the subject of broadcasting, and that the committee will act in an advisory capacity to the Secretary of Commerce in matters of government radio regulation, and, further, will consider all radio questions of interdepartmental interest.

Trade Notes

New Eby Binding Post



THE H. H. Eby Manufacturing Company, 605 Arch Street, Philadelphia, has added another design to its line of metal binding posts. This new style is the same in all respects as the type this firm is now marketing, with the exception that, instead of having a tapped base to take a standard machine screw, it has a solid threaded stem. It is made in three sizes, and is known to the trade by the code words SER-GEANT "SS," BUDDY, and MIDGET; the first $\frac{1}{4}$ inch in diameter with $\frac{1}{2}$ x 10-32-inch stem, the second $\frac{3}{8}$ inch in diameter with $\frac{3}{8}$ x 8-32-inch stem, and the latter 5-16 inch in diameter with $\frac{3}{8}$ x 4-36-inch stem. This design permits the posts to be mounted more quickly, by simply screwing a hexagon nut on the stem. The company advises that it is now in production on all the sizes mentioned.

Chicago's Next Big Radio Event

THE fastest radio operators in America, if not in the world, together with the world's greatest experts in the radio development and construction field, are to attend the International Radio Congress, Chicago, August 6, 7 and 8, held in connection with the Pageant of Progress at Municipal Pier.

Major J. O. Mauborgne, signal officer of the Sixth Army Corps Area, located at Chicago, and associate with Major General George O. Squier, chief signal officer of the United States Army, is president of the congress. He will preside at the main sessions, of which there will be five. The details of arrangement are in the hands of a committee of Chicago radio men, headed by Commissioner George E. Carlson,

department of electricity of the City of Chicago, and head of the Chicago Municipal Radio station, as chairman.

One of the features of the congress will be a "radio marathon" for a diamond medal, to be held Sunday morning, August 6, and participated in by the fastest receiving operators that can be assembled. The rules of the contest as outlined by the officials of the congress, and by Lawrence R. Schmitt, United States Inspector for the Ninth Radio District, who will supervise the event, including the following:

The diamond medal, valued at several hundred dollars, is donated by Commissioner Carlson, and applications for entry should be directed to him at Room 614, City Hall, Chicago. Applicants must give their names, addresses, business connection, age, and previous records. The contest will be an elimination affair.

Pignolet Radio Voltmeter

The amateur user of regenerative and amplifying radio receiver sets, finds it indispensable to have some means to tell when the filament current is adjusted so as to get the best reproduction, as well as the longest life, from his tubes. In addition, there is need for testing A and B batteries, circuits, coils, condensers, etc., especially if trouble develops and the set does not work well.

These tests have usually required several instruments, such as ammeters in order to measure the filament current, low-reading voltmeters for the A batteries and high reading voltmeters for the B batteries. The Pignolet two-range voltmeter has been designed specially for testing of receiving sets, and will make all tests at a considerable saving.

The instrument is of the movable coil, permanent magnet, dead-beat type, and is complete with corrector for zero errors. The base of the portable meter is of polished wood $4\frac{1}{4}$ inches in diameter. The scale is 3 inches long, with widely spaced divisions permitting close readings on both ranges.

The low range reads from 0-7½ volts in fifth-volt scale divisions, easily readable in tenths as the divisions are wide and half divisions can be accurately estimated even by an inexperienced user.

The high range of the meter is from 0 to 150 volts, and is designed specially for testing and detecting weak B batteries that would interfere with the operation of the set, testing plate voltages, circuits, coils, condensers, etc.

The Pignolet instrument is furnished, also, in switchboard models for mounting on panels; but the portable type is recommended, as with it the connections for the various tests are more easily made.

New Firms and Corporations

New \$21,000,000 Corporation

Among the charters recently filed in Dover, Delaware, is that of the National Radio Consolidation, New York, for the purpose of manufacturing radio equipment. The capital stock of this new corporation is \$21,000,000. The United States Corporation Company, is the holding Company.

Electric Merchandise Service Corp., purchasing agents, \$75,000; Philadelphia, Pa. (Attorney, Corporation Guarantee and Trust Company.)

Monarch Appliance and Radio Corp., Manhattan, \$10,000; A. J. Kollin, L. Goldberg.

Electra Radio Corp., Buffalo, makes wireless instruments, \$50,000; H. L. Jauch, W. M. Taylor, F. J. Maloney. (Attorneys, Dirnberger & Moore, Buffalo.)

Radio Supply Company. H. A. Daake, Hordell, N. Y.

The Radio Shop, Batesville, Ark. Mr. W. H. Walkup, of this company, writes: "We have been amateurs for four years, and lately started to manufacture and sell radio supplies. Business is extra good."

Ayer & Bullard, radio sets and supplies, Dexter, Maine.

Last-Minute Radio News! U. S. Radio Compass Station

Important Items Tuned in by Radio World Reporters Just Before Going to Press

Richard E. Enright, police commissioner of New York City, now in London, cables that fingerprints and photographs of crooks will be sent by radio from one part of the world to another in the near future.

The Scandinavian-American liner, "Hellig Olav," and the Norwegian-American steamer, "Bergensford," arrived in New York half an hour apart. During their eleven days at sea, neither steamer was more than 75 miles from the other. During the journey passengers on both vessels freely conversed by radio.

Robert F. Gowen, of Ossining, New York, radio expert, has returned from China. He reports that the use of the radiotelephone is rapidly spreading over that country. "Its use is largely commercial," says Mr. Gowen.

William M. McWilliams, of Morristown, Ohio, is conducting his political campaign entirely by radio.

The New York City Broadcasting Station, says Grover D. Whalen, commissioner of Plant and Structures, will be in operation before the first of September.

Reports from New Orleans indicate a growing interest in radio all over the South. Applications for broadcasting licenses were sent to Washington from a dozen quarters, during the past week.

The Consolidated Radio Corporation, to manufacture radio apparatus, has been incorporated at Dover, Delaware, for \$1,000,000. Attorney, The Delaware Registration Trust Co.

Business Outlook Is Steadily Improving

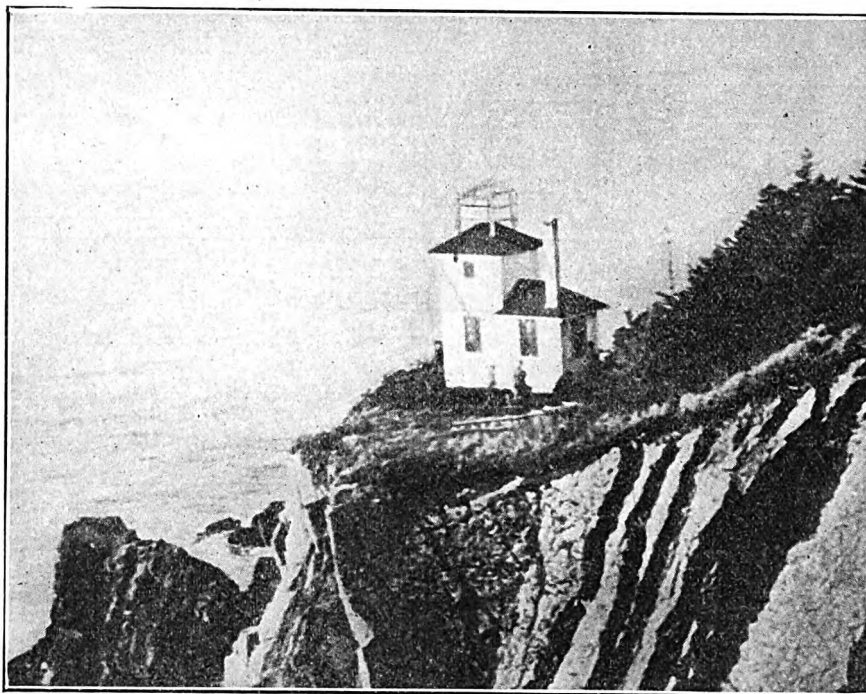
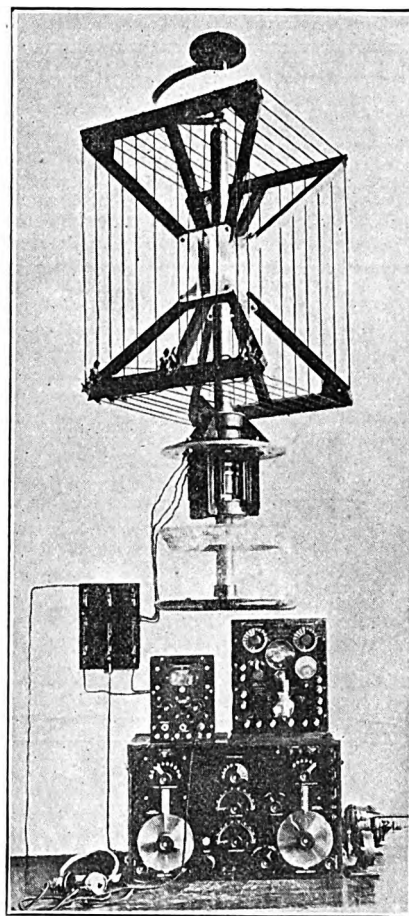
FAILURES and failure liabilities continue to ebb, the latter more quickly than the former, and comparisons with a year ago, says "Bradstreets," though still unfavorable, tend to improve as the months advance and the unmistakable improvement in underlying conditions becomes more manifest. June failures in number were the smallest recorded in any month since last September, while liabilities were the lightest of any month since October, 1920. Failures and liabilities for the second quarter of this year also make an especially favorable contrast with the totals for the first three months of this year.

The totals for the half year ending with June 30, however, constitute new high records in Bradstreet's history of failures. Evidences of continuance of strain in business are found in the high proportion of assets to liabilities reported in the first half year, which have been exceeded only twice in a period of forty-three years. The preponderance of failures at the South is still a matter of note, but the proportion of liabilities in the Middle Atlantic States is slightly in excess of that at the South.

There were 1,656 failures in June, a decrease of 6.7 per cent. from the total for May and of 40 per cent. from the peak point of January this year, but 19 per cent. in excess of June a year ago. Liabilities for June were \$38,412,782, a decrease of 20 per cent. from May, and of 30 per cent. from June a year ago, while only slightly more than one-third those of the peak month of January. Failures and liabilities in June were about four times the number and value of those of the low-water month of June, 1919.

The improvement noted in the past three months is shown by the fact that failures, which totaled 5,385 in the second quarter, were 24 per cent. below those of the first quarter, 13 per cent. below those of the fourth quarter of 1921, and 12 per cent. below the total

in the first quarter of 1915, although 30 per cent. more numerous than in the second quarter of 1921, and the fourth largest quarterly total ever recorded. Liabilities for the second quarter, \$159,706,654, were 31 per cent. less than the peak liabilities in the first quarter of this year and 3 per cent. less than in the second quarter of 1921.



(C. Kadel & Herbert News Service.)

The use of the radio compass has revolutionized navigation, especially as it pertains to handling ships in dense fog and warning the navigators of dangerous waters. Many of these stations have been erected along our coast lines. The range of these compass stations is over 200 miles. Some of these radio stations are situated at isolated points, but are giving valuable assistance to vessels of the world. The upper photograph shows the Navy radio compass used in stations to warn vessels of dangerous waters and to direct boats in fog. The lower photograph shows the Naval radio compass station at Cape Hinchinbrook, Alaska. This is a typical view of the exterior of a naval radio compass station and indicates the desolate locations in which it has been found necessary to establish these stations to protect vessels in dangerous waters.

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Fifteen Naval Radio Shore- Stations on Great Lakes

THREE new radio-compass stations,
in Michigan, have been completed
by the United States Navy Department.
They are at Grand Marais, Whitefish
Point, and Point Detour, where they will
serve the ships that pass back and forth
through Sault St. Marie, from Lake
Superior to Lake Huron—a dangerous
passage, marked by many wrecks caused
chiefly by fogs.

With the three compass-stations in
operation, it should be a simple matter
for all mariners to secure frequent and
exact compass bearings and avoid adding
to the "grave yard" of the Great Lakes.

A Naval subchaser on a recent cruise
into Lake Superior, made a test run for
the calibration of the stations at Grand
Marais and Whitefish Point, which work
together off the northwestern entrance
of the strait, and reported the job com-
pleted and the stations ready for work
as soon as the personnel is assembled.

Naval radio stations guard all the
ships on the Great Lakes.

It is virtually impossible for mariners
equipped with wireless to get lost in the
Lakes, to-day. The completion of the
three stations finishes a chain of fifteen
Naval shore-stations from Duluth to
Buffalo. A ship may now keep in con-
stant touch with its home port provided
its headquarters is fitted with radio.
Both owners and operators, it is said,
are rapidly coming to install radio on
their ships, several companies having
their entire fleets and home stations so
equipped, many of them through the pur-
chase of surplus Naval radio-equipment.

The use of the Naval radio stations at
Alpena, Buffalo, Chicago, Cleveland,
Detroit, Duluth, Eagle Harbor, Great
Lakes, Mackinac Island, Manistique, Mil-
waukee, and Whitefish Point, for relay
purposes, saves delayed and expensive
communication when contact with the
owner or operating office is necessary.
Soon every ship on the Great Lakes will
be equipped with radio just as all transat-
lantic steamers are equipped for safety
and convenience.

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Times Building, New York City, June 9, 1922.

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Yours truly,

(Signed) David J. Farley, Times Bldg., Newsstand.

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The Forerunner of KDKA

ALMOST any radio amateur who owned a set capable of good range reception, prior to 1921, is familiar with the history of station SXX of Wilkesburg, Pennsylvania, operated by Frank Conrad. These amateurs know of the phonograph concerts broadcast by Mr. Conrad during a period of a year and which were heard as far West as the Catalina Islands. They may recall hearing his request for records one night and may have sent him one, for there were 500 records received in answer to his plea. This was early in 1920, before the radio broadcasting craze had swept the country and was, possibly, the first indication that radio broadcasting had some wonderful possibilities as a medium of entertainment.

SXX has not been very active the past two years; for KDKA, of the Westinghouse Electric & Manufacturing Company, at East Pittsburgh, has taken its place as the broadcaster of Pittsburgh and environs. But even so, little SXX was the forerunner of powerful KDKA and actually was the indirect means of bringing the attention of H. P. Davis, vice-president of the Westinghouse Company, to the radio phone as a means of popular entertainment and instruction.

Many radio amateurs who know Frank Conrad as a broadcaster of ability may not know that he is assistant chief engineer of the Westinghouse Company and besides being the inventor of a great deal of radio apparatus including a combined receiving and transmitting set for the United States Signal Corps which was used in France during the World War and a short wave meter, is one of the most prolific electrical inventors of the present day.

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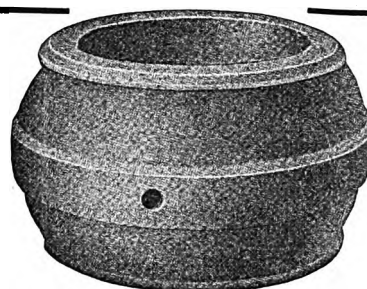
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Radio Tanks for Army and Marine Corps

RADIO-controlled tanks is the latest step in government radio work for the Army and, probably, for the Marine Corps. To date, no definite plan has been evolved by radio engineering experts; but after the Navy successfully operated the "Iowa" by radio control, the leading scientists of the Army believe radio-controlled tanks are a certainty.

One out of every eight or ten Army tanks has a radio transmitting and receiving set, enabling this leading, or control, tank to keep in close touch with headquarters constantly and to communicate by signals with its fellows in battle. Such efficient liaison is a tremendous step in military science, as the tanks could also serve as message centers for infantry troops, as well as spot artillery fire, and keep headquarters posted as to the position of the advance lines. That all Army tanks and the Marine Corp will be equipped with radio communicating outfits, is believed possible before January 1, 1923. At the recent maneuvers at Gettysburg, the Marines used some Army tanks, one of which was a "master tank" equipped with radio.

While the method of the radio-control of the battleship "Iowa," by the "Ohio," last summer during the bombing maneuvers, has been carefully guarded, and the details of radio-controlled automobiles never revealed, it is understood that Army radio experts have all the necessary principles well in hand and that the first radio-controlled tank will be christened before many months have passed; then American forces, will have one of the most efficient military weapons—one that needs no personnel. During the World War, the tanks used did not even have radio communication, but signaled visually, or reported by messengers or runners.

Dead Spots in Radio's Silent Zones

THE perfect reception of wireless signals, and especially of telephoning, depends mainly on the power of the transmitter and the sensitiveness and active tuning of the receiver. These are known factors, but there are others which are largely mysterious, even to experts. There are places where difficulty is experienced in receiving wireless signals, and others where their reception appears almost impossible from certain directions."

So writes a radio correspondent of the Daily News, London, dealing with certain localities where wireless signals cannot be picked up. He goes on:

Some localities are known as "dead" spots, though for this there is no explanation, while others are said to be "screened" by iron, or other ore, in neighboring hills.

One of the best known "dead" spots is in the Red Sea, about one day's steaming from Aden. Ships passing through this region can read no signals from the Aden station; but on leaving it, messages are suddenly picked up again at full strength. From a certain position in the Mediterranean, vessels cannot get their signals to Port Said; whereas, messages from vessels and stations much further away, but at different angles, are read perfectly.

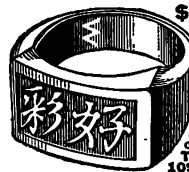
About 1,500 miles out from New York, on the way to Rio de Janeiro, signals from Washington cease to be heard for about 48 hours, after which they come in again

strongly and are then workable to the limit of the station's night range.

There are several places at sea where intervening mountains prevent the reception of signals from stations at the other side. The Peak of Teneriffe acts as an effective "blanket" between the Teneriffe station and vessels approaching from the north. At Vigo, in Spain, a wireless station was moved to overcome a similar difficulty. Vessels sailing from Cape Town to Durban cross an ocean stretch where the Cape Town signals are unheard.

On the other hand, there are certain extraordinarily sensitive areas in which signals can be read with unusual clearness.

It is expected that wireless broadcasting on short wave-lengths will provide interesting data in regard to "dead" or "screened" spots in England, as it has done in America.—Special to *The World*, New York.



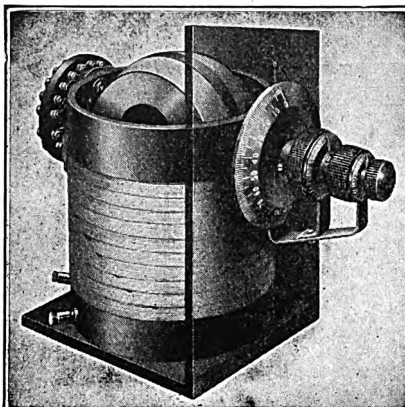
\$2,800 in 2 HOURS!
—Is what your Genuine Chinese says! Good Luck Ring brought me. I say! Fannie Price, Hottel, tell us our ring brought success in love, business and financially. Ours is the genuine and original ring, stamped inside with these words: "Believed by Ancient to bring Good Luck, Health, Happiness, Prosperity, Solid Sterling Silver, Price, Postpaid, Cash with order \$1.50, or C. O. D. \$1.50." THE ZANZIBAR CO. Dept. 288 109 West 42d St. New York City

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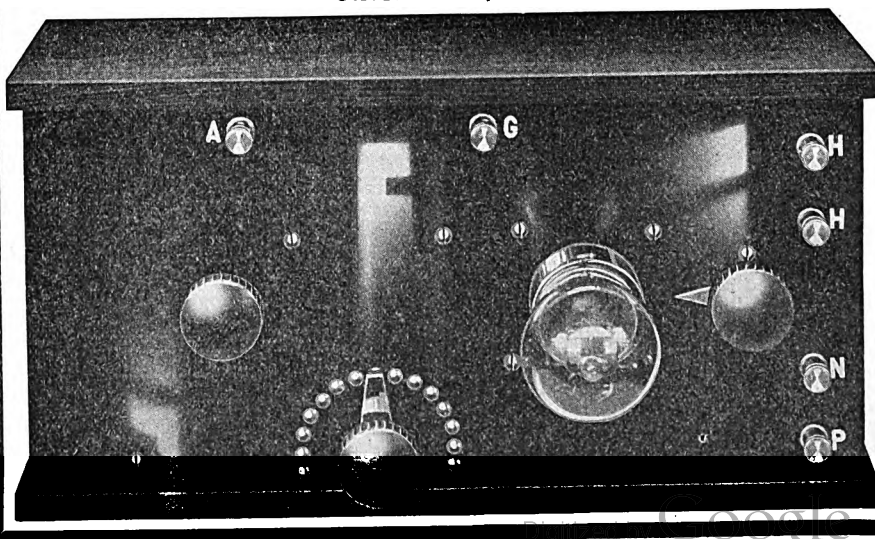
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**Broadcast Bill's Radio-
lays**

By *William E. Douglass*
(Copyright, 1922, Westinghouse Electric
& Manufacturing Co.)

THE "All Stars" here, in Brussels
Sprouts, has struck a winnin' streak—
last week we cleaned up Canton an' to-day
'twas Quiver Creek. The boys made me
the manager so I don't like to talk, but
you should a seen our team to-day, we
beat 'em at a walk. Well, bein's how I'm
manager, I hafta keep well posted on all
the big league dope an' sich or else I
sure get roasted. O' course I read the
papers but the best way that I know to
get the dope hot off the bat is by my
radio. So every day you'll find me hang-
in' round my wireless set, those rubber
ear-muffs clamped on tight so I won't
miss a bet. An' speakin' about bettin',
that reminds me of a joke we pulled to-
day down at the store,—I thought the
boys would choke. A travelin' man, some



city chap, wuz loafin' at the store an'
braggin' 'bout the team at Chi while
waitin' for the score. He said his dope
was never wrong an' that the Yanks
would lose, an' all the time I kept a grin.
I didn't tell th' news. He didn't know
my radio had just told me who won, an'
though we got th' score by wire after
the game wuz done. I sez, "Oh well I
guess them Yanks is pretty good at that."
Then he sez, "Why you're crazy man,
you're talkin' through yer hat. I'll
betcha ten t' five," an' then he shoved a
bill at me. Sez I, "I'll take that bet with
yuh, the Yanks won four to three." He
wouldn't take my word fer it an' said he
guessed he'd wait until th' score come in
by wire. But it wuz gettin' late so I
sez, "Come on over to my house an' see
my set, an' when they send 'em out again
you'll be right there t' get some first
hand information." "Well," sez he,
"that there's a go." I took him home
an' introduced him to my radio. He lis-
tened to the scores an' news an' then
said, with a grin, "Well boys I guess the
joke's on me." I guess it musta bin.

Another boon for the farmer! Newark
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This move, it is hoped, will bring the
grower and consumer closer together.

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Shipping Board Resents Cornering Tubes

WASHINGTON, D. C.—Better radio-service at sea is assured through the decision of the Radio Corporation of America to sell vacuum receiving tubes to ship stations, according to F. P. Guthrie, head of the Radio Division of the Shipping Board. Privately owned ships, as well as government operated vessels, may now be equipped with the latest types of radio-receiving tubes, even though the ships are in direct competition with the Radio Corporation of America, which controls the patents and production of the tubes.

Following an urgent request from the Shipping Board that all American vessels be permitted to purchase the very best and latest radio equipment in the interests of the safety of life and property at sea, the representatives of the corporation have agreed that a special receiving tube, for ships only, will be produced to sell for ten dollars each. The tubes, which can also be used for amplifying and transmitting, will be a big improvement over the crystal detectors and spark transmitting sets now in use.

Heretofore the Radio Corporation has refused to sell its tubes except to amateurs and for experimental use. The sale of tubes to commercial companies competing with their transmitting and receiving stations was refused until the Shipping Board officials appealed in the interest of ship stations. At first the corporation insisted on the payment of an excessive royalty running to about \$400 per ship, except for Government use, but finally acquiesced to the humanitarian plea of the Shipping board, and drew up a special contract for sea radio stations, forbidding the use of the tubes ashore.

The new sea tube is said to be better than the tubes sold for \$7.50

All Were Amateurs Once

EDITOR, Radio World:—In the June 17th, issue of RADIO WORLD, I notice a letter from a Mr. James H. Hoeveler answering another letter from a Mr. Ralph S. Garrick. I am sorry that I did not see Mr. Garrick's letter, but whatever he said, I agree with him.

Mr. Hoeveler is trespassing on sacred ground when he calls himself a "ham." He seems to forget that the old-time amateur was here first and that it was mainly through him that present-day wonders in the radio field were made possible. All of the "big boys" in radio, to-day, were formerly amateurs. Senatore Marconi, in a recent speech, via radiophone, boasted—and really feels proud—that he was an amateur; in fact, he insists on being called one now. Bearing in mind the fact that amateurs are limited to a certain amount of power, it sure was some feather in our cap when over twenty-five of our stations were recently copied in Scotland. We will concede that we are a minority so far as numbers go; but so far as gray matter in connection with radio is concerned—"no comparison at all!"—George A. Schaefer, No. 8AUL.

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NEWSDEALERS ATTENTION!

Many of your customers will want the first sixteen issues of Radio World. Your wholesaler may have a few copies on hand. Inquire. If you cannot get back numbers write us and we will try to supply you so that your customers will have a complete file of Radio World from the first issue.

If you happen to have a few copies on hand, keep and display them and you will find that they will sell. Very shortly it will be impossible to get back numbers of these earlier issues.

Radio World, 1493 Broadway,
New York City.

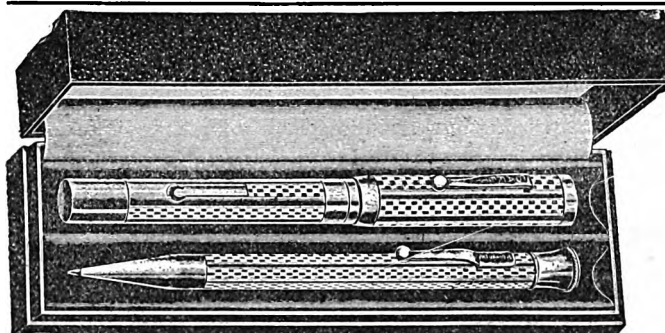
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The rate for this RADIO WORLD QUICK-ACTION CLASSIFIED AD. DEPT. is 5c. per word (minimum of 10 words, including address), 10% discount for 4 consecutive insertions, 15% for 13 consecutive insertions (3 months). Changes will be made in standing classified ads., if copy is received at this office before 4 P. M. on any second Tuesday preceding date of publication. RADIO WORLD CO., 1493 Broadway, N. Y. C. (Phone, Bryant 4796.)

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What the Highly Sensitized Receiver Will Do

THE transatlantic sending and reception, accomplished in 1901, by Marconi, demonstrated that the radio waves tend to follow the earth's surface, or else that they can take a direct course through water and earth; for, of course, there is a big curve between the coast of Ireland and the coast of Newfoundland. So, after that demonstration, says "The Literary Digest," New York, the skeptical were more or less silent; and it did not call for much imagination to conceive that the entire world must ultimately be the field of a powerful transmitting radio-station. What was called for was a sufficiently powerful transmitter, or a sufficiently sensitive receiver—one or the other. At first attention centered chiefly on powerful transmission; but latterly—and particularly since the success of the amateur transatlantic test last December—it is coming to be more fully recognized that almost any transmitter will answer if we can sufficiently sensitize the receiving apparatus.

The new era began when Dr. De Forest put a grid into the electron tube. The audion or triode thus produced constitutes the most sensitive energy-trap ever devised. To compare it with the original Marconi coherer, or even with the improved crystal detector, is to compare things of quite different orders. According to Bureau of Standards estimates, an ordinary crystal detector requires for its operation a current of about 50 microamperes. An exceptionally sensitive crystal can handle a current of 10 microamperes; comparing in sensitiveness with the electro tube in the simplest detector circuit. But with a specially good detector tube, or an ordinary tube connected in a simple Armstrong regenerative circuit, one microampere of current suffices; and for an oscillating tube operating in a good circuit under satisfactory conditions, a current of the one-hundredth of a microampere.

Otherwise stated, the De Forest audion operating under good conditions in an

Armstrong circuit for regenerative amplification, is 5,000 times more sensitive than an ordinary crystal, and 1,000 times more sensitive than the best crystal.

And now comes Armstrong with his super-regenerative circuit, which is said to make a receiving set of two electron tubes a thousand times more sensitive than the superheterodyne receiver of eight or ten tubes devised by the same inventor, and used by Paul Godley in the famous transatlantic tests. To compute the amount of current necessary to actuate such an apparatus, would be to deal in infinitesimal quantities of energy, more or less comparable to the energy of starlight.

And all this has direct bearing on radio ambitions. The new work gives pretty full assurance that a sensitive receiver alone can solve the problem of worldwide communication.

Latest broadcasting map 15c. That is, a complete broadcasting map appeared in Radio World, No. 8, dated May 20. Mailed on receipt of 15c. Radio World Company, 1493 Broadway, N. Y. C.

Our supply of back numbers of RADIO WORLD (Nos. 1 to 16) is limited. We will take orders for the first sixteen issues until the supply is exhausted. If you want these numbers, or want your subscription to start with any special number, let us know.

RADIO WORLD CO., 1493 Broadway, New York City

To many anxious inquirers. RADIO WORLD has no free list. One copy is sent as a voucher to each advertiser or advertising agent represented in current issues. All other copies are paid for on subscription or through the news trade.

Amateurs May Make Own Sets Despite Patents

SO many readers are puzzled by their rights to construct their own sets without coming into contact with the numerous awe-inspiring patents they read and hear about, that a word on the subject might not come amiss, says "The Globe," New York.

There is no reason, either in law or ethics, why a person should not make any type of set or part and utilize any hook-up he pleases as long as the set is destined for his own use and is not offered for sale.

When it comes to making apparatus for sale there are few patented parts which it is within the power of amateur to make, owing to his limited manufacturing resources. However, the safest course in respect to these parts is to purchase them for inclusion in the set to be sold, as in the case of design patents on coil, etc., or to sell the set without, as in the case of tubes.

The crystal set is covered by no patent, to our knowledge, save certain design patents on a few parts, which may be made in a different style by the amateur without infringing on the patent or bought if he so desires. Quite a number of experienced radio amateurs are making their pin money by constructing crystal sets for beginners, and there can be no objection to this practise—so long as the set is honestly made and sold on a conservative representation.

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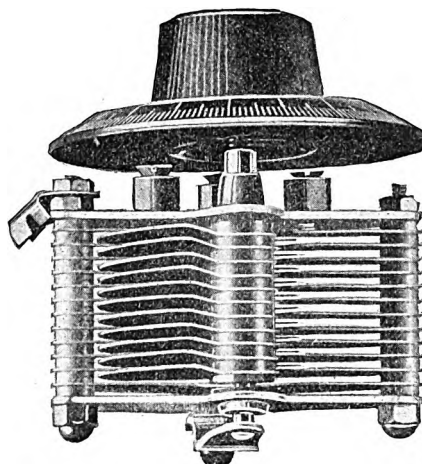
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New Radio Society

The National Cooperative Radio Society has been organized at New Orleans, Louisiana. The object of the society is to effect a national community of interest among parties now interested, or may hereafter become interested, in radio. It proposes to build its own broadcasting stations Max N. Kohler, 214 Saratoga St., New Orleans, La., is the secretary-treasurer.

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513-D Sixth Avenue New York

Published Every Wednesday

July 29

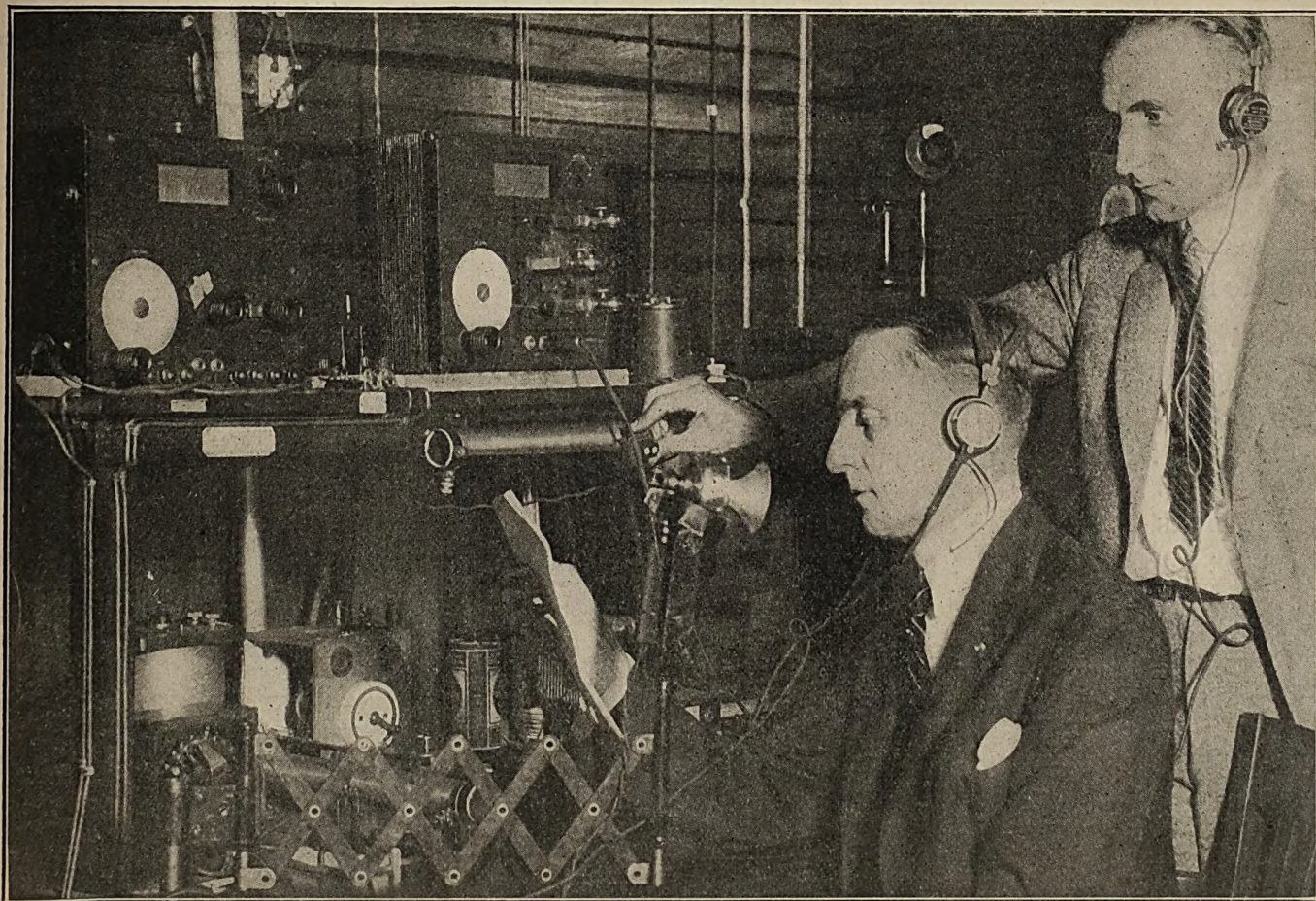
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RADIO WORLD

Entered as second-class matter, March 28, 1922, at the post office at New York City, New York, under the act of March 3, 1879.

I L L U S T R A T E D

If You Need Skilled Workers—Hook Up!



(C. Underwood & Underwood.)

The latest method of securing skilled workers was put in operation by Dr. Rogers, of the Veterans' Bureau, Washington, D. C., when he broadcast a list of vacancies for former service men. The list of positions open had been sent to the Bureau by a number of industrial firms. Dr. Rogers, in turn, sent it over the country. The broadcasting resulted in a large number of men being put to work who otherwise might have remained idle.

My 20-Kilowatt Tube, By Irving Langmuir

See
Page 9

SPECIAL INTRODUCTORY

BARGAIN

DICTOGRAPH HEADSET \$9.00

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**CENTRAL-KANSAS
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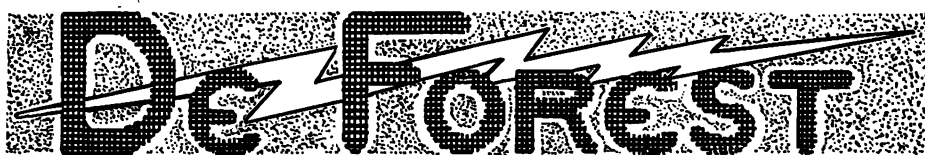
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For Those Who Build Their Own

The same care should be taken when purchasing Radio Parts as when buying a complete Receiving Set. De Forest Radiophone Parts are unequalled in quality of materials, workmanship and correctness of design. Insist upon De Forest when purchasing the following instruments:

Rheostats	Coil Mountings
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Grid Leaks	Tube Receptacles
Condensers	Crystal Detectors
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"Famous For Dependability"

Latest broadcasting map 15c. That is, a complete broadcasting map appeared in Radio World, No. 8, dated May 20. Mailed on receipt of 15c. Radio World Company, 1493 Broadway, N. Y. C.

If you did not get copies of Radio World No. 1 to No. 16 send us \$2.20 or we will send you this paper for one year, (\$6.00 for 52 issues) and start it with our first issue, which will be mailed you as soon as possible after receipt of order.



The Radio "Colyum"

THE first contrib to this colyum advises us that, in the Middle West, the latest thing is the "radio cake-eater." This bird, we are informed, cuts into a concert program with a description of his entertaining qualities and wants to know if he can escort any good-looking young lady home.

Second contrib writes that he has heard of an amplified trombone for broadcasting purposes. "Sallright so long as the beginners don't get hold of 'em."

We presume that the lucky office seekers, this fall, who intend to utilize radio when campaigning will not forget the primary coil.

A girl out in old Kokomo,
Once had a deaf mute for a beau
They couldn't hold hands
As true love demands
Until both understood radio

M. J. J., drops in with his tidbit to "The News," New York: If they call a man who operates an aeroplane an aviator, and one who navigates a steamer a navigator, then whynell isn't a radio man a radiator?

"Knowlton had drifted to the South Sea Islands to get away from the world," says a fiction writer. Not so. Radio would have found him out eventually.

First Radio-Engineering Student—My atmospheric reputation is pretty good, this week

Second Radio-Engineering Student—Your reputation was always atmospheric.

Old Bill Shakespeare may have had radio in mind when he wrote: "Friends, Romans, Countrymen! Lend me your ears."

Atlantic City note: "The bathing suits here are so loud they drown out the static."

Marconi admits he has not yet heard from Mars. Probably another case of "no foreign entanglements desired," says *The American*, New York.

During the past few years men have been very fussy about their cellars. The slogan, to-day, is: "Look to your roof!"

McJones of New Jersey didn't intend to shock the family when he called them "damned" and "undamned" waves.

The "Three-Step" and the "Anti-frequency Coupler" are the latest radio dances.

Our Own Broadcasting Station
OUCH for week beginning July 31, 1922
7:01—Bed-linen Tales, by Hop Sing, managing director of our laundry.

7:32—Very Sentimental Ballads (No 2)
"How to Keep a Family Flivver on Twenty Dollars Per."

7:51—"Don'ts for Jailers," by Sing Sing 4-11-44.

8:11—"The Soup Eaters Chorus," by Childs Restaurant Corporation. N. B.—This number (defies static).

8:31—My Latest Sherlock Ohms Story: "Spirits, Spirits Everywhere; But Not a Drop to Drink," by Conan Doyle.

8:43—Recipes I Have Never Tried: "How to Keep Pickled Onions from Turning Sour," by Kit Chenstove.

9:00—Foolish Question No. 899,472: "Why Does a Grid Leak?"

9:11—How to Keep Congress from Getting on Your Nerves.

9:28—Debate: "The Hip Subsidy Bill" Old John Barleycorn vs.: The Anti-Saloon League.

9:46—Instructions for Eat-a-Prune-a-Day Week.

9:55—Correct time from Patagonia.

10:00—GOOD NIGHT!

—ROBERT MACKAY.

RADIO WORLD

[Copyright, 1922, by Radio World Co., New York, N. Y.]

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Vol. 1, No. 18

July 29, 1922

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Static Interference Reduced by Antenna

By John Kent

THE thousands of amateur radio-fans, a majority of whom are realizing for the first time what an interference static is to the reception of the various programs broadcast, will be interested in knowing what means the large commercial companies, such as the Radio Corporation of America, are taking to offset this atmospheric disturbance.

Perhaps the chief means used by the Radio Corporation is in the type of aerial. This is known as the "wave" antenna, which in addition to reducing static interference, has greatly increased the efficiency of transatlantic wireless telegraphy.

An explanation of this antenna is best gained by a description of its use at the chief receiving-station of the Radio Corporation, located at Riverhead, Long Island. This station receives from all European stations which are using wave lengths ranging around 15,000 meters in length; or, in other words, electromagnetic waves each, approximately, nine miles long.

In order to fulfill all of the requirements of the theory covering the operation of the new antenna, it is necessary to have a receiving aerial one full wave-length long—in other words, a receiving aerial nine miles in length. This is exactly what has been installed at Riverhead. The aerial is nine miles long, and is supported on poles thirty feet above the ground, one end being grounded through a non-inductive resistance, and the other through a variable inductance. With this wire, the Riverhead station is daily receiving five different European stations simultaneously without interference.

To illustrate the operation of the "wave" antenna, an engineer of the Radio Corporation of America has drawn the following analogy:

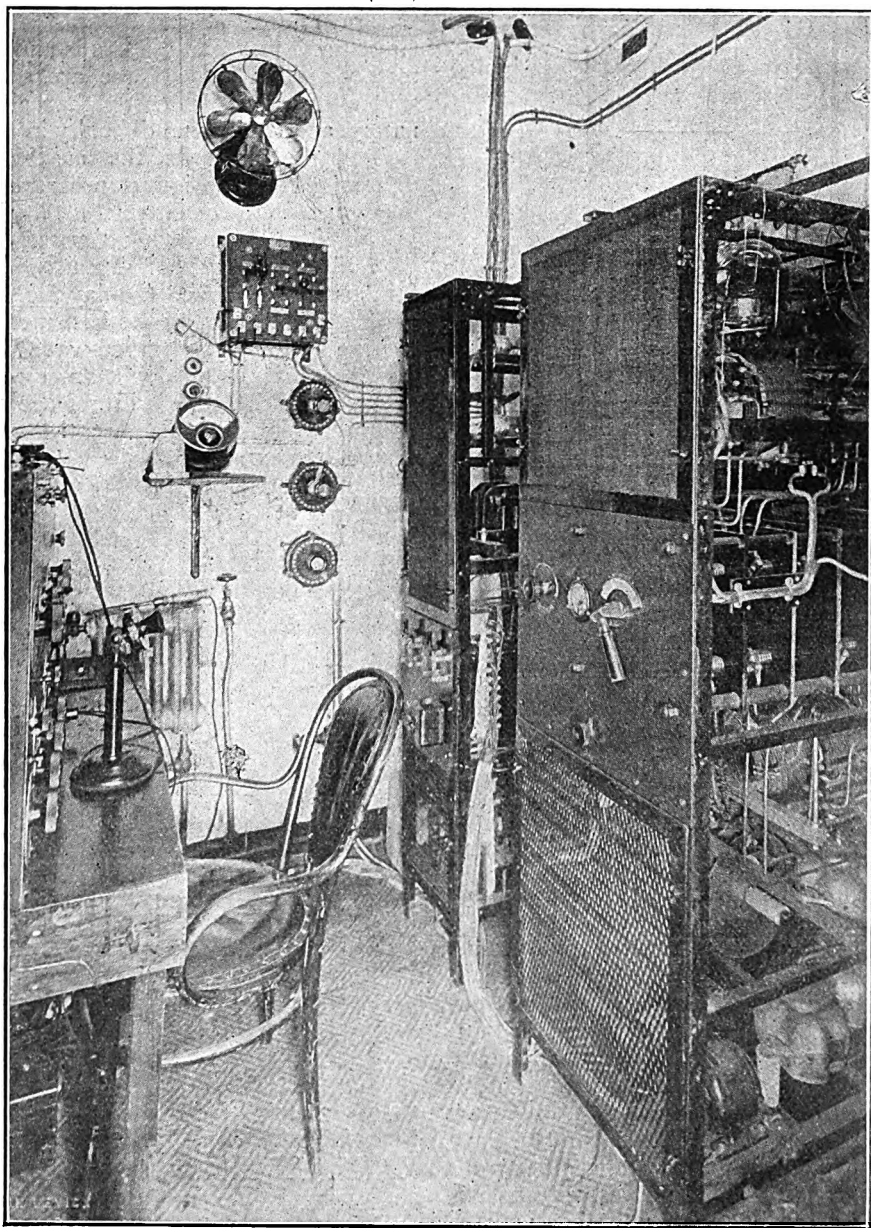
If we look on the new antenna as a large lake and the wind as the static, we can get an idea how it works. Suppose the wind is blowing across the lake, from east to west. At the eastern end there will be few or no ripples; but as we get to the western end, the ripples will

gradually increase in size to full waves. If the shore at the western end is a gentle slope of sandy gravel, the waves will be dissipated and will not be reflected.

If, on the other hand, the shore of the lake is precipitous and rocky,

the waves will be reflected and will disturb the eastern end of the lake. Now this antenna, having a non-inductive resistance at its non-receiving end, corresponds to a sandy shore, because it absorbs the static and does not reflect it.

Radio Room of an Ocean Liner



(C. Underwood & Underwood, N. Y.)

With this equipment the "America" telephones from midocean.

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The Vacuum Tube as a Transmitter

By Charles H. Plath

WITH the adoption of C W (continuous wave), we were able to work far better than with the old-time spark gap. There are many radio amateurs who operated prior to the radiotelephone, and who seem disturbed if an article is published condemning the damped-wave type of spark gap. Among amateurs this device is better known as the "stone crusher"; because, when in operation, it destroys the harmony of the concerts being broadcasted. It must be understood that this type spark-gap, better known as the damped-wave spark, takes in most frequencies, and with the adoption of C W, considerable interference will be eliminated.

The damped wave is created by an oscillating body, the oscillations of

a continuous wave. Continuous waves vary in amplitude, in radiotelephony. One important fact regarding C W, or undamped waves, is to keep the current constant. It is also necessary to furnish just the same amount of energy during each oscillation as is lost in that oscillation. An undamped wave is very pure and has none of the characteristics of a broad wave. It carries more energy in a given amount of time than damped waves.

There are a number of ways to generate damped and undamped waves. We will endeavor to mention the methods of the undamped type. One of these methods is the use of the Alexanderson high-frequency generator, or alternator. This alternator is capable of generating alternating currents of radio frequency. The energy lost in each oscillation is supplied direct by the generator. Another is by the Golschmidt machine. There is another method: by means of the arc. Arc transmitters are less costly than alternators, and there is no difficulty in controlling the wave lengths, as this is determined by the inductance and capacity values in the circuit.

The fourth method of generating the undamped wave is by means of the famous vacuum tube. To-day the tube generator is becoming the best method for the so-called undamped-wave generator. There is no doubt among scientists that the tube will replace the alternator for long-distance transmission at less expense.

In using a vacuum tube as a transmitter we must utilize the three-electrode vacuum tube, specially built to carry high potentials on the plate. For amateur use the 5-watt tube is used. Other tubes range in value up to 250-watts input. Using C W means that the wave bands must not be so wide, because it is possible, with this type transmission, to tune very close. The three-electrode vacuum-tube oscillator circuits have found wide application not only in undamped wave-receiving but in radio transmitting.

By studying the schematic diagrams furnished herewith, it will be seen that it is possible to use a single vacuum-tube for detection in transmitting or for generating local oscillations. A simple circuit is shown. The circuit may be designed so as to require no adjustment for coupling, for a fairly

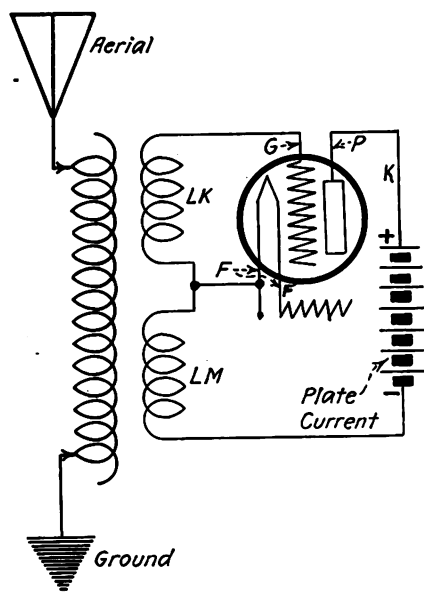


Figure 1—A simple circuit essentially similar to Figure 2. This circuit may be so designed as to require no coupling adjustment for a fairly long range of wave lengths. Suggested by Charles H. Plath. Drawn by S. Newman & Co.

which are gradually fading out. This gradual fading out of an oscillation means that the current of the oscillation gradually decreases its value. An undamped wave is originated by an oscillating body, whose oscillations always retain their maximum value. Thus, in an undamped radio-set, the oscillations—and, also, the wave generated by the oscillation—is continuous so long as the power is applied.

This means that there are no wave trains in undamped waves as there are in damped waves. An undamped wave is, also, a continuous wave; but a continuous wave is not necessarily an undamped wave. Any unbroken wave is

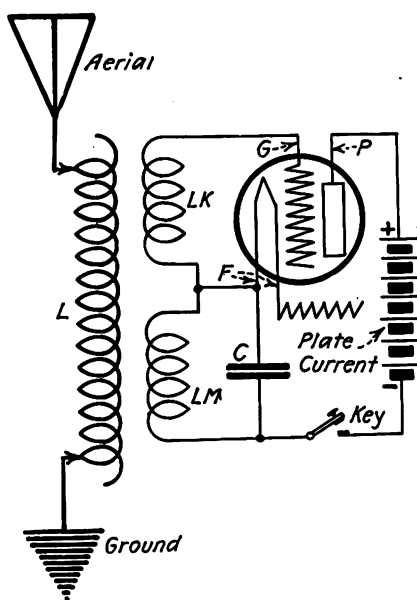


Figure 2—Showing the same circuit as that of Figure 1 with the key inserted in the plate circuit, making it possible to transmit continuous waves. Suggested by Charles H. Plath. Drawn by S. Newman & Co.

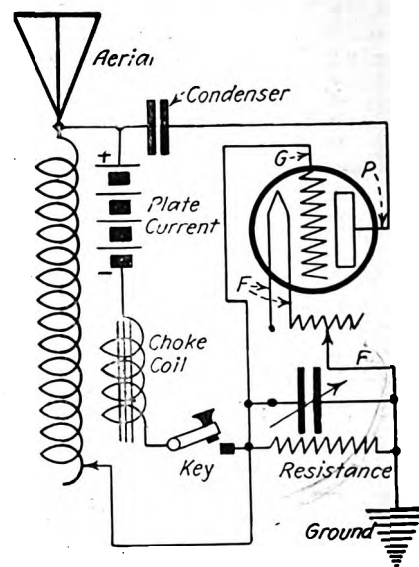


Figure 3—The circuit shown in this sketch is an application of the electrostatically coupled circuit. Suggested by Charles H. Plath. Drawn by S. Newman & Co.

large range of wave lengths. The only adjustment necessary is tuning the antenna circuit so that it will have a natural wave-length equal to the wave-length to be transmitted.

The method of placing the key in the grid circuit has a tendency to stop the oscillations flowing, but does not stop the electronic flow from filament to plate. It merely disconnects and insulates the grid which, then, accumulates a negative charge. When the key is closed to start the oscillations the charge must leak off first and a certain lag takes place in the building up of the oscillations to their final value. This is objectionable, as it introduces harmonics in the radiated

(Continued from preceding page)

wave. This objection may be obviated by shunting the key contacts by a resistance of several megohms to provide a leakage path for the charge from grid to filament while the key is open. This circuit will not operate satisfactorily with a low-power tube and large antenna. It may be entirely inoperative with an antenna having too large a radiation for the tube to use.

In order to overcome the tendency of the circuit—to refuse to oscillate when used with a low-power tube—a circuit using an intermediate oscillatory circuit is shown. It has been used successfully. Considering the antenna circuit as non-existent, the vacuum-tube oscillator is very satisfactory in this circuit. For results in the plate to grid coupling, strong undamped waves are set up in the plate oscillatory circuit—L-M-C.

The oscillating current in the circuit, L-M-C, may be many times the D-C plate current. If now the antenna circuit is tuned to the circuit, L-M-C, and coupled to it, as shown in the accompanying diagram, the current in the plate-oscillatory circuit will induce undamped oscillations in the antenna circuit; and these oscillations, due to the large resonance current in circuit L-M-C, will be of sufficiently great amplitude to operate the circuit despite the radiation of energy from the antenna.

It may be advisable to describe the circuit, or the method of adjustment of this kind, in order to radiate at desired wave lengths. The antenna circuit is first opened, or its coupling so reduced that it will be appreciably energized by the vacuum-tube circuit and may be considered as absent. The key is closed, and the vacuum-tube circuit is adjusted for maximum-oscillation generation. This is done simply by adjusting the grid-to-plate coupling until maximum reading is obtained when using an ammeter in the plate circuit. The antenna circuit is there fairly loosely coupled to the plate oscillatory circuit, and is tuned to that circuit by varying the inductance and capacitance. The final step, then, is to obtain the coupling between the antenna and plate-oscillating circuit from which maximum energy will be transformed from the latter to the former. Be careful of too close a coupling, as this will give you a double-humped resonance curve in the antenna circuit.

This may be checked up for any value of coupling by varying the wave length of the antenna circuit.

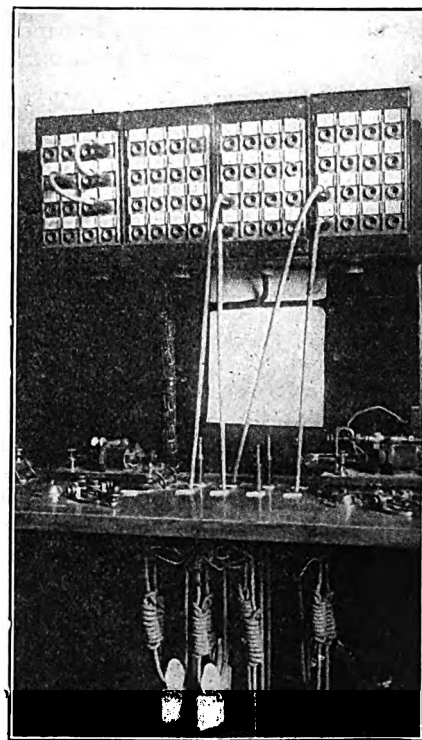
Machine to Speed Transmitting



(Both photographs. C. Harris & Ewing, Washington, D. C. From Paul Thompson, N. Y.)

How It Works

Sending radio messages by hand is almost a thing of the past. Today in most every naval radio station an automatic transmitting-machine is installed. This enables the sender to operate the keyboard similar to that of a typewriter. This machine functions like a punching machine, perforating holes for the letters punched. The machines are used for speed, accuracy and economy. The operator, after punching, examines the perforated tape to see if he has punched a wrong letter. If so the mistake may be quickly corrected. Machines of this type are called "Kleinschmidts," and are used in all transAtlantic radio stations. With them operators can send about 45 words a minute. The smaller photograph shows the main radio-switchboard of the radio central located at the Arlington Station, Arlington, Virginia. Each of the holes, or sockets, represent a distant station. By inserting the plug into the proper hole, or socket, a signal is transmitted. This method of transmission is called remote control. It is used by the Navy Department in all of its main stations.



First 17 Numbers of Radio World

If you did not get copies of Radio World No. 1 to No. 17 send us \$2.50, or we will send you this paper for one year, (\$6.00 for 52 issues) and start it with our first issue, which will be mailed you as soon as possible after receipt of order.

—Advt.

The Radio Primer

The beginner who follows regularly this department in RADIO WORLD will secure a liberal education in the applied principles of radio science

The Beginner's Catechism

By Edward Linwood

CAN electric-light current (direct) cause more interference than alternating?

The electric-light currents cause interference in a receiving set only when the aerial is running parallel to the electric-light wires, or when the generators are very close to the receiving set. In case of alternating current, the interference takes the form of a continuous hum, corresponding to the 60-cycle note of the current. In case of direct current, the interference is somewhat more irregular and is caused by commutator ripples.

* * *

How may this interference be prevented?

This interference may be eliminated if the aerals are run at right angles to the electric-light wires.

* * *

What is lightning arrester?

A lightning arrester consists of a very small air-gap between two pieces of metal inclosed in a vacuum.

* * *

Must a wire lead from the ground to the arrester?

It is absolutely imperative that you have a wire from one side of the arrester to the ground connection. It must be a good ground-connection. The aerial will be attached to the other side of the arrester.

* * *

How far should a lead-in be from the side of the house?

It is best to keep the wire at least five inches from the side of the house. This can be done by bracket insulators.

* * *

Which is preferable—a lightning switch or an arrester?

A lightning arrester is preferable to a switch as it functions automatically and eliminates the personal element. With a lightning switch you might forget to throw the switch over to the ground connection; whereas, with the arrester, such an operation is unnecessary and, consequently, you are protected all the time.

* * *

During a lightning storm, wouldn't the lightning follow the wire leading in

as well as the wire leading to the arrester which may be secured outside of the house?

Lightning has the peculiar property of taking the shortest path toward the ground. It prefers to jump across a very small air-gap inside of a lightning arrester than pass through the turns of a tuning coil to ground. Do not have any fear regarding this, as the device will thoroughly protect the house and it meets all requirements of the fire underwriters.

* * *

What are call letters and what do they represent?

All radio transmitters have call letters. Just as motor-cars have licensed numbers on plates, so do radio stations; only, instead of numbers, radio transmitters have letters. When one station wishes to call another, it simply does so by means of the call letters of the desired station.

* * *

Who assigns these call letters. Is there a book giving a list of them?

The United States government assigns the call letters at the time the station receives its license. A list of all licensed stations may be secured by writing to the Superintendent of Documents, Washington, D. C. Enclose fifteen cents and request a copy of "Amateur" Radio Stations of the United States" and "Commercial and Government Radio Stations of the United States."

* * *

Why are the grid condenser and leak combined?

Principally for the sake of compactness and because they lend themselves to such a combination.

Radio World's Revised Radio Dictionary

By Fred. Chas. Ehlert

Ground—In radio the ground connection is the other side of the wave distributing system. Its main function is with the antenna or aerial and acts as a large condenser that is between the aerial and ground.

Impedance—The term applied to the resistance offered by a coil of wire to a current flowing through it. This is due to the counter EMF, or the total opposition of a circuit to a varying current, which, in turn, due to its ohmic resistance and the reactance of the circuit.

Inductance—Plays a very important part in radio circuits. The unit of inductance is the "Henry." It may be defined as the property of an electrical circuit which opposes a change of current in a given time. It is the transfer of an electrified body to a non-electrified body of close proximity, but without actual contact.

Insulator—A material through which electricity will not pass.

Induction Coil—An instrument for producing high voltages from low-voltage currents.

Interrupter—An instrument for breaking up a direct current into a series of impulses, thus producing a current for radio use called an intermittent current.

Ionization—The breaking up of molecules into atoms. The gas or air employed becomes ionized or conductive.

Kilowatt—A unit used in measuring large amounts of electricity. Meaning 1,000 watts.

Loop Aerial—A small frame usually from three to six feet in size wound with a number of turns of wire. It is used indoors, eliminating the outdoor aerial and ground connections.

Loud speaker—Any device used for reproducing signals, or speech, loud enough to be heard without the use of telephone receivers.

Low-frequency current—A current from 60 to 500 cycles.

Megohm—One million ohms.

Magnetic field—The entire space from which a magnet extends its magnetic influence.

Microfarad—One millionth part of a farad and the unit of capacity.

Milliampere—One thousandth part of one ampere.

Microphone—A sound magnifier. A device for converting sounds into electrical equivalents in a given circuit.

Broadcasting Has Come to Stay

By Guglielmo Marconi

ITHINK that broadcasting has come to stay. In thousands of homes, in this country, there are radiotelephone receivers and thousands of intelligent people, young and old, men and women, well able to use them, even able to make the apparatus and, in many cases, contributing or striving to contribute valuable information concerning the problem still unsolved. I think I am safe in saying that since radio has already done so much for the safety of life at sea, for commerce, and for commercial and military communications, it is also destined to bring new and unforeseen opportunities in health and recreation into the lives of millions of homes.

Startling Demand for Radio Instruction in New Jersey

IN New Jersey the demand for radio instruction has been so strong that the Department of Public Instruction has taken charge of the work and expects to have courses in radio in every school where shop work or manual training is a part of the curriculum. Several years ago, according to The Times, New York, radio sets were made in the manual arts department in the schools of this State, but the boys' interest could not be sustained so long as the dot and dash system of signals only was available. Now the opportunity of hearing the actual voices, words, songs and music of the best kind has taken this project out of the more experimental stage and made practically every boy anxious to build and own a wireless set for his own use.

Every effort has been made in schools throughout New Jersey to give boys a chance to design and build radio sets. The shop teachers have made a special study of radio construction, and boys have been given an opportunity to make various types of wireless sets. Schools have installed large radio sets. Montclair, N. J., has erected over its high school an aerial that equals in size and construction those seen at broadcasting stations. A receiving set has been installed in the physics department, and at the last meeting of the Board of Education money was voted for the purchase of a sending set. Many of the high-school boys are licensed radio operators. In the manual arts department of the grammar schools at Montclair more than 600 wireless sets have been made.

A report from Jersey City states that 665 radio sets have been built by upper-grade boys, while in the Hoboken High and Junior High school during this year 350 wireless sets have been made.

A great deal of attention has been given to the study of wireless in the public schools of East Orange. In the elementary schools 750 crystal sets have been constructed by boys taking shop work. The high-school boys have made 327 crystal receiving sets, 29 tube outfits with one and two stages of amplification, and one sending set is nearly completed.

Navy Radio Ship En Route to Alaska

"GOLD STAR," radio repair ship of the United States Navy, steamed out of Nanaimo en route to Kodiak, Alaska, on July 11, where she will supply and repair the Navy's ten radio stations during the summer. This unique ship, captained by Commander John B. Earle, is named for the mothers of the men lost in the service during the World War. Equipped with all manner of radio apparatus, spare parts, and supplies, she carries a crew of expert repair and equipment men, capable of erecting a complete station or repairing a transmitting tube. "Gold Star" is a 7,420-ton ship, carrying a complement of 300 officers and men.

To-day the Navy is operating the following traffic stations in Alaska: St. George, St. Paul, Dutch Harbor, Kodiak, Seward, Cordova, Juneau, and Ketchikan, and two compass stations at Cape Hinchinbrook and Soapstone Point, which form a chain of communications in Alaska and adjacent waters with trans-Pacific stations, besides serving as a relief in the event of a break in the Pacific cable. As the stations are all difficult to reach, except between April and October, and few commercial vessels reach them, the Navy has put "Gold Star" into service to supply the men stationed there with food, clothing, and relief.

Last-Minute Radio News!

*Important Items Tuned in by Radio World Reporters
Just Before Going to Press*

IT has been decided that the transmitter of New York City's new broadcasting station will be installed on the top floor of the Municipal Building, there being a room there that calls for practically no alterations. Band concerts will be broadcast to the various city parks, where receiving sets with loudspeakers will be placed so that a single concert may be heard in various parts of the city. When noted persons are received by the city, the ceremonies will be broadcast. All official city news will be sent out in this way. Every police station and fire house will be equipped with receiving sets so that the forces that protect the citizenry may be marshaled and directed with lightninglike speed.

Candidates for Congress will be permitted to broadcast their political speeches by radio for two weeks prior to election if plans of the American Radio Association with national headquarters at Washington materialize.

The opening address of Herbert R. Hoover, Secretary of Commerce, at the first convention of the National Radio Chamber of Commerce, at Washington, D. C., showed that he is very much in sympathy with radio but would like to see Congress take a little more action in its work regarding broadcasting regulations and other matters.

Forest fires raging in the State of Washington were quickly checked, during the past week, by airplanes equipped with radio.

Figures just announced indicate that in New York State, during the month of May, 1922, 1717 new radio corporations were organized.

A new airplane passenger-service is to be put in operation between Lisbon and Buenos Aires. The planes will carry fifty passengers. They will be guided by radio.

The Radio Electric Company, of Pittsburgh, has been assigned call letters WHAF for its broadcasting station. Scheduled programs will begin about September 1. This broadcasting station will be under the direction of Parker R. Wiggin, chief engineer of The Radio Electric Company.

The opening of new Signal Corps radio stations at Fort Benning, Georgia, and Fort Totten, New York, bring the total stations to 53, and with the cooperation of the Naval Station at Boston, one more point is reached. A new station planned for Fort Sill, Oklahoma, will hook the Eighth Corps Area into the Army Radio Net, which will then embrace practically the whole country.

The Independent Radio Corporation, \$100,000, has been incorporated at Wilmington, Delaware. Directors: Hartin E. Smith and M. D. Jukes. Artemas Smith, Wilmington, Del., is the agent.

The copper market is very brisk. The price has advanced practically 1/8 cent a pound. The demand is for August and September. Financial writers attribute this rise to radio manufacturing.

To China goes the honor of installing the longest commercial radiotelephone circuit in the world. Radio telephone sets have been installed at Peking and Tientsin, covering a gap of ninety miles.

Steamers of the Detroit and Cleveland Navigation Company, plying between Buffalo and Detroit, have been equipped with both receiving and transmitting sets.

Radio Choir to Kill Jazz



(C. Kadel & Herbert News Service.)

A California radio choir that hopes to annihilate jazz by broadcasting music that is based on old melodic principles.

Navy Plans Radio-Equipped Airships

By Washington R. Service

WASHINGTON, D. C.—The largest airships in the world, now building for the United States Navy, one at Lakehurst, New Jersey, and the other at Friederichshafen, Germany, will have the latest and best radio-equipment capable of development. Anticipating their completion, their home port is being fitted up for their arrival with a high-powered radio station.

A new type of radio-transmitting antenna without towers has just been installed at the Naval airship base at Lakehurst, which is Naval Radio Station NEL. In an effort to keep the big landing field clear for the two giant rigids, ZR 1 and ZR 3, to eliminate high towers and aerials, the radio engineers of the Navy designed a long low aerial. It is nearly 800 feet long and fully 120 feet wide, forming a sort of gridiron, mounted on poles only 60 feet in height instead of between 150 and 200 feet. Technically it is a multiple-tuned antenna with several ground leads. By erecting the aerial

along one side of the field, a clear open space is left for maneuvering the ships.

Recent transmission tests with the new aerial have carried messages on 900 meters to Newport, Rhode Island, and Norfolk, Virginia, distances approximating 200 to 250 miles, which indicates excellent daytime service. Daytime communication with the big airships when they are cruising within about 300 miles of the station is promised. At present, a vacuum transmitting set with 1 kilowatt in the antenna, is used, and the experts believe that on clear nights in winter communication may be carried on with aircraft or ships fully 2,000 miles out on the Atlantic. This will insure the picking up of the German-built ZR 3, on her maiden trip to her home port, before she is a third of the way over. When the R-38 made her initial trans-Atlantic cruise, she was not heard from until within about 600 miles of New York.

The new aerial was designed and

built by the Naval Aircraft Radio Laboratory at Anacosta, and installed at Lakehurst by radio men from the Philadelphia Navy Yard.

In addition to the new radio transmitting set, Lakehurst will have a radio-compass station which will enable the dirigibles to determine their positions in the air within a radius of two hundred miles, and locate the field when returning from a cruise in darkness or in dense fogs. Radio equipment for the big rigid ships has not been designed; but it is understood that, as plenty of room will be available for engine-driven generators producing great transmitting power, a very long range set can be installed. It is anticipated that both radiotelegraph and radio-telephone communication may be carried on up to 300 and 100 miles

United States Army plans for new radio sets for the semi-rigid airships call for central power-stations which would include generators geared to gasoline engines, after the fashion in which a magneto is driven, but never before attempted. The French tried out belt-driven electrical generators, but with little success. However, representatives of the Air Service Engineering Department, at McCook Field, expect to develop a central power-plant that will give sufficient power for putting half a kilowatt in the antenna and, also, power for lighting, heat, and electrical control work.

The Army Air Service plans to use the new Signal Corps set 135, combining radiophone and telegraph circuits good for distances up to 75 miles and 200 miles respectively. The range will be greater than is planned for the big Martin bombers, however, as better facilities for erecting aerials are available on airships than on planes. One method considered is to install the antenna within the envelope; another is to suspend it below the ship, drawing it up upon landing; while a third contemplates hanging the wires of the aerial along the sides and over the top of the ship. Experiments will determine which of these methods is the most efficient.

Naval radio experts are loath to reveal their definite plans for the radio equipment of the ZR ships; but, it is said, they may parallel the Army's ideas although their ships will be about twice the size of the largest semi-rigids now planned, giving them more latitude and more room for equipment.

Mother's Clothesline Their Aerial



(C. Kadel & Herbert News Service.)

After many weeks of patient toil little Daniel Callahan (seated) completed this double-circuit regenerative-receiver, every snitch of what you see in the photograph being either made or assembled by him. He then proceeded to erect an aerial on the roof; but, sad to say, a cold-hearted landlord who had forgotten his own boyhood days made Daniel take it down. But Danny fooled him with a bright idea. His mother's clothesline, suspended across the backyard, has a wire run through its center. This he successfully utilized as an aerial. When photographed he was telling his friend, Joseph Early, all about it.

Curious Calls of the Ether

By Carl Hawes Butman

WASHINGTON, D. C.—Assigning radio calls is something of a trick. With the constant increase of stations, it promises to become an art. In this country, we have but three initial-letter calls for about 5,000 official and commercial stations, which makes the designation of appropriate calls almost impossible. Having only the letters N, K and W to start a word with, even champion wordmakers who spell thousands of words out of trade names, would be stumped in the position of chief radio inspector of the Department of Commerce.

In some instances he has done pretty well. All calls starting with N are Naval, which is very appropriate, and the Army calls commence with W, which is somewhat significant as referring to the War Department. The rest of the W calls, he heedlessly assigned to the Eastern part of the United States, leaving K for the West Coast. The definite geographical call WVA (W. VA.) went to a city in Alaska; while to a Naval station at Savannah, Georgia, he gave the letters NEV (NEV.) which, perchance, would have suited a station in Carson City far better.

When the inspector got down to specific stations, however, he did far better; what could be more suitable than the call assigned to the Detroit Police Department, KOP—unmistakable! In view of the recent revelations by Adolph Busch, some of the Shipping Board's calls are quite appropriate. The craft known as the "West Gotomska" carries the significant call WET, while the "Rio Grande" answers to the calls of KEG. The "Chamblee" has the same signal, but spells it KEGG; while the "West Hartland" makes it plural, KEGS. Speaking liquorishly, Great Britain got a gem of a call in the anti-prohibition signal, GIN; and, also, since she has V with several other letters, uses the call VOP—significant of a very fine brand in the old days. Russia, with the letter R, of course has RUM and RYE ships. Another vessel of the Shipping Board has a startling title when it comes to radio prefixes, KORK, which some experts insist belongs to Ireland.

The chief call-assigner of Great Britain, with the letters B and G, and Y, had a lot more chance to display his versatility in issuing signals. Among unusual British calls are BVD, GOP, and YAP—more

suitable for America, it would seem. YES falls to Great Britain; but OUI happens to be Danish instead of French, showing that other radio inspectors may have no humor.

One Southern Pacific passenger ship bears the title of a famous southern fraternity, KKK, and an Italian contemporary goes it one better with the well-known call, IWW. Japan has one appropriate signal—JAP. A French radio station carries the designation FUN; and a British submarine, the "Polly-Anna," the title GLAD. Another English sub bears the name of GABY, formerly of France. FAN aptly denotes one French operator, and an unfortunate Madagascan station got FLU.

Some American naval vessels have calls which spell the names of their sweethearts, NAN and NEL, while another ship has the sentimental call KISS. Radio broadcasters have a perfect right to kick when assigned such calls as WEAK and WEEP, yet two suffer under those titles notwithstanding good service, showing the failings of the radio inspector who made another mistake when he gave the significant call, WEAR, to a newspaper instead of to a clothing manufacturer.

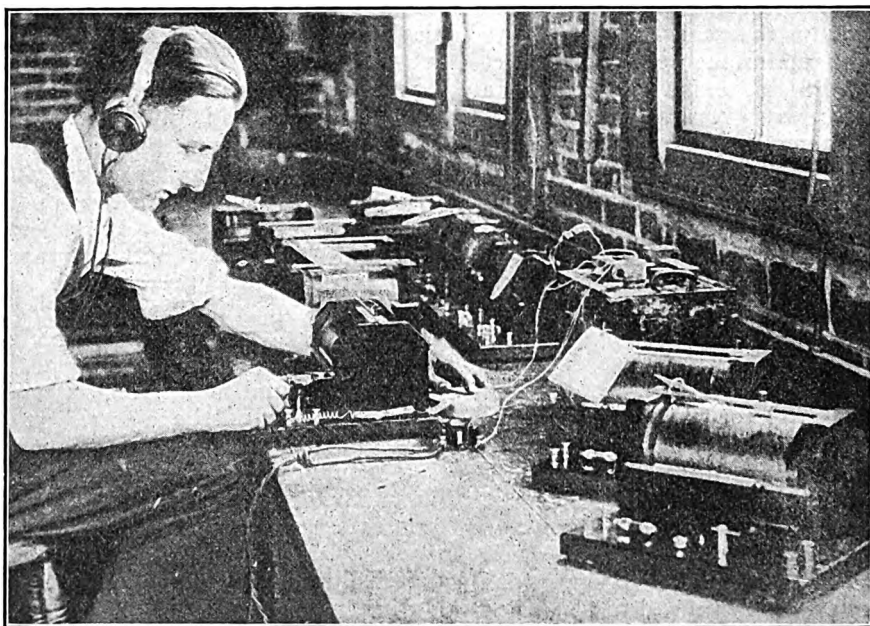
Tips For the Radio Fan

TO reduce the howls and noises coming through your telephones, a good method is to sheath the cabinet inside and ground it. This is accomplished by using sheet metal such as tin foil, copper, aluminum, or tin. Simply make it fast close against the inside of the front panel. All necessary drilling in panel can be done through sheathing, also. When sheathing has been finished, ground any side, or end, of metal sheet used to the ground post. This will eliminate all body capacity effects and reduce some of the noises. A piece of metal secured between the tubes and properly grounded will benefit the set considerably.

Your Lightning Switch

YOUR lightning switch, on being installed, should be placed in series with aerial and ground outside your window. For this purpose, No. 4 wire is best. When closing your station for the night, always see that the lightning switch is thrown in such a position that the aerial is well grounded. This will prevent its being affected by electrical storms.

Raised Funds Making Sets



(C. Underwood & Underwood.)

The latest college endowment fund drive was successfully carried out by Tufts College, Massachusetts. Three students in the engineering school made amateur radio receiving-sets, which were sold, and yielded a substantial profit to the "Jumbo Bond Campaign." These sets have a listening radius of 25 miles and a wave length range up to 1,800 meters. Myron S. Allen, Class of '23, is shown testing one of the sets.

My 20-Kilowatt Tube and Its Uses

By Irving Langmuir,

Research Laboratory, General Electric Company

THE three-electrode vacuum tube, which first appeared as the De Forest audion, is now universally used not only for the receiving of radio messages, but is coming into more widespread use in connection with the transmission of such messages. The original De Forest audion did not have a particularly high vacuum, and, because of the ionization of the residual gas, could not be operated at more than 30 or 40 volts, or at more than a few milliamperes of current.

Several years ago, in connection with a study of the Edison effect in incandescent lamps, I noted that, in lamps with a very good vacuum, the Edison effect was nearly absent. In other words, although there was a difference of 110 volts between the two ends of the filament, very little electron current flowed across the vacuum space between. In the presence of a little gas, however, such big currents were obtained that the currents might lead to the formation of an arc, with resulting destruction of the lamp.

At that time it was not at all understood why these currents should become smaller as the vacuum was improved, and a great many scientists believed that if a perfect vacuum could be made no current at all would flow across it. Although the Edison effect in well-made lamps thus caused no difficulty in their manufacture, for it practically did not exist, yet it was a point of very great scientific interest to learn why these currents were so small in a good vacuum.

It was in connection with these studies that we discovered a "space charge effect." We then understood that in a high vacuum the electrons got in each other's way, so that the electrons that had already left the filament repelled, because of their negative charge, the electrons which followed and tended to drive them back into the hot filament which emitted them. In the presence of gas this effect did not exist, because the gas formed both positive and negative ions, and the accumulation of the slowly moving positive ions in the space neutralized the effect of the negative electrons.

As the result of these studies it gradually became clear how it would be possible to construct vacuum tubes which would operate at high voltages and at high currents. One of the early applications



DR. IRVING LANGMUIR

In his right hand Dr. Langmuir is holding his new 20-kilowatt radio tube—the tube that may mean telephoning across the Atlantic Ocean. It is a tiny thing compared with the device in his left hand—a 201 radiotron, so commonly used by amateurs. The gigantic alternators generating a 200-kilowatt current may be superseded by this simple little invention.

of this new knowledge was made by Dr. W. D. Coolidge, who utilized this in the development of the Coolidge X-ray tube, an X-ray tube which has gradually displaced practically all of the older, so-called gas tubes.

Another application was found in the kenotron and pliotron. The kenotron is a vacuum tube rectifier, having two electrodes like the Fleming valve but capable of operating up to voltages of several thousand volts and with currents comparable with an ampere or more. Tubes of this kind have found application for smoke precipitation, for various electrical testing devices, and in connection with the regulation of the electric generators used for the radio transmitting outfits on aeroplanes during the war. The development of the kenotron into a thoroughly practical device for these purposes is largely the result of the work of Dr. Saul Dushman.

The pliotron bears about the same relation to the De Forest audion that the kenotron does to the Fleming valve. It is a device which contains three electrodes, namely, a filament, grid, and plate, like the audion, but it is capable of being

operated at high voltages and currents, so that considerable amounts of power may be controlled. Tubes of this sort are now finding widespread application for transmitting radio messages, particularly for radio telephony. The ordinary radio telephone outfit, used for broadcasting, generates from $\frac{1}{2}$ to 5 kilowatts of high frequency power, which is used to feed the antenna.

The design and construction of tubes of this type has been carried out principally by Mr. W. C. White.

It has long been realized that, following out the principles made use of in the smaller tubes, it would ultimately be possible to construct tubes of larger power. There have been many difficulties to overcome, however. After years of work by Mr. W. C. White and Mr. H. J. Nolte, they have succeeded in designing and perfecting pliotrons which are capable of generating about 20 kw. of high frequency current. In principle, these tubes resemble the smaller tubes which are now usually called radiotrons, in that they also have three electrodes. These large tubes are used in circuits much like those used by amateurs when they cause the tube to generate oscillations. In the construction, however, there are many differences.

The 20-kilowatt tube has a very large rugged filament, many times the diameter and length of the ordinary radiotron. The grid is in cylindrical form and surrounds the filament, and the plate is a metallic cylinder about $1\frac{1}{2}$ inches in diameter and 8 inches long, which is sealed directly to a glass tube through which pass the leads carrying current to the filament and grid.

Thus the plate, instead of being inside of the tube, as in ordinary radiotrons, forms a part of the outside wall of the tube. In order to dissipate the relatively large amount of energy liberated at the plate, the plate is water cooled, which is rendered particularly easy by the fact that part of its surface forms a part of the wall of the tube.

These 20-kilowatt tubes are ordinarily operated with about 20,000 volts d. c., which is obtained from ordinary 60-cycle alternating current by rectification, using two or more kenotrons, together with large condensers for smoothing out the rectified alternating current.

A bank of ten tubes of this kind



Broadcasting has given many an experienced orator, or singer, a new experience in stage fright.

—Chuck Ward in "The Globe," New York.

The Wave Length

THE wave length is a term used to denote the length of the electromagnetic wave that is traveling through space from the transmitting station. A wave length of 360 meters means that this wave is of that length from crest to crest. It is quite possible with transmitting apparatus to produce waves of any desired length by varying the amount of capacity and inductance in the transmitting circuits. Theoretically, the length of the wave has nothing to do with the distance over which it will travel. The distance is governed by the amount of power used at the transmitting station. In practice, however, it is generally found that greater distance can be covered with longer waves than with shorter waves, using the same amount of power. For reception purposes, a single wire aerial 100 feet long will be far better for you than the 300-foot wire for short wave purposes.

operated in parallel is capable of generating 200-kilowatt of power, which is about all that is required for most transoceanic radio communication. It is probable that outfits of this kind will displace the larger and more expensive alternators, the most successful type of which has been the Alexanderson alternator.

The 20-kilowatt tube merely marks one stage in the development of still larger tubes. It will undoubtedly be possible, when the need arises and when the necessary development work has been completed, to construct tubes of many hundreds, or even thousands, of kilowatts. Such devices will probably be used not merely for radio purposes, but may ultimately play an important part in such problems as the electrification of railroads and the transmission of power to long distance by means of direct current.

Subscribe for RADIO WORLD. \$6.00 a year, \$3.00 six months, \$1.50 three months.

Eager School Boys Assemble Sets



(C. Keystone View Co., N. Y.)

There are many vocational schools in the United States today where the construction of various parts of radio sets is an important element of the curriculum. There is a keen rivalry among students to see which will turn out the most efficient set.

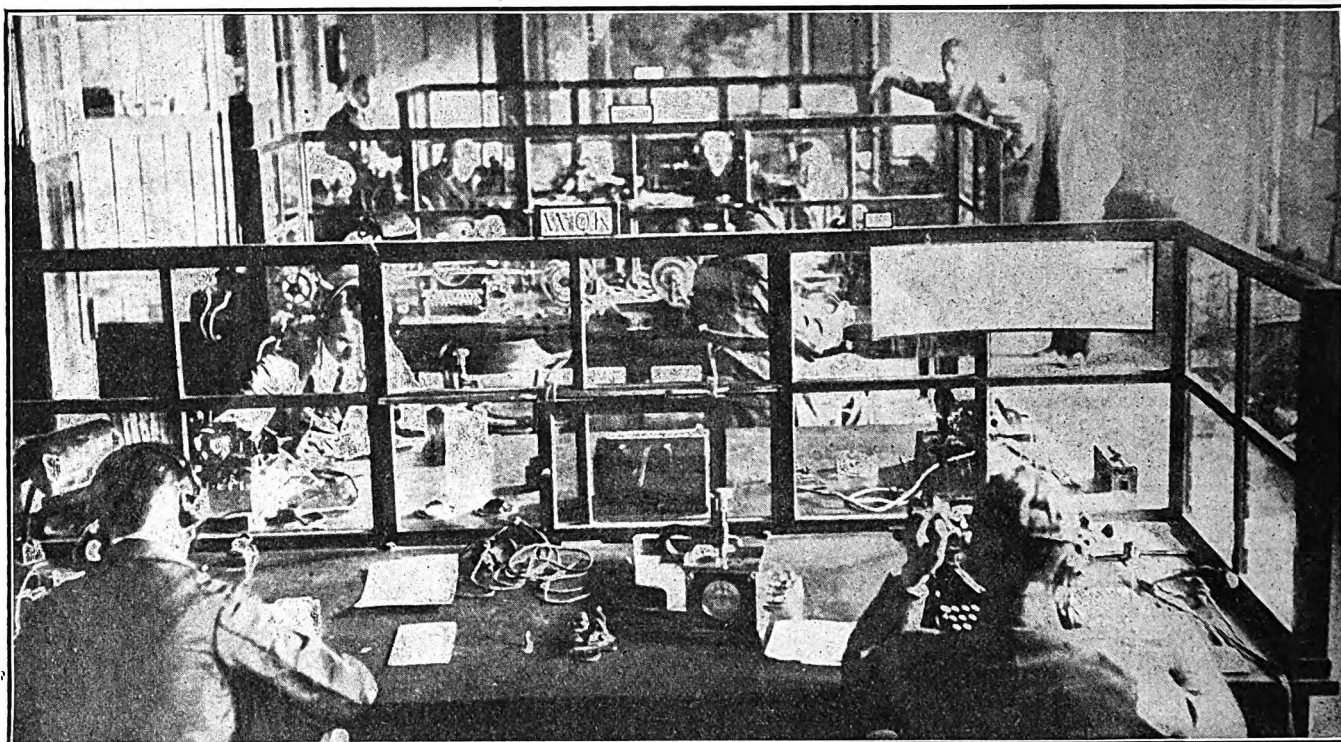
Their Landlord Permits Aerials!



(C. International.)

The result is a happy family and a host of highly pleased friends—all listening to a concert by radio. As Marconi says: Radio will keep the home intact.

Transatlantic Radio Station in Berlin



(C. Underwood & Underwood, N. Y.).

Receiving and transmitting room of the New Transatlantic Radio Central, recently opened in Berlin, Germany. It is one of the largest stations in the world, and is completely equipped for sending messages to America.

Importance of the Capacity Switch

THE desire to place all the controlling elements of a cabinet radio receiving-set on the outside of the panel, has brought into general use the capacity switch for the primary-tuning circuit.

A capacity switch consists of two metal blades—long, narrow, and thin—rotating around a center rod which

By E. L. Bragdon

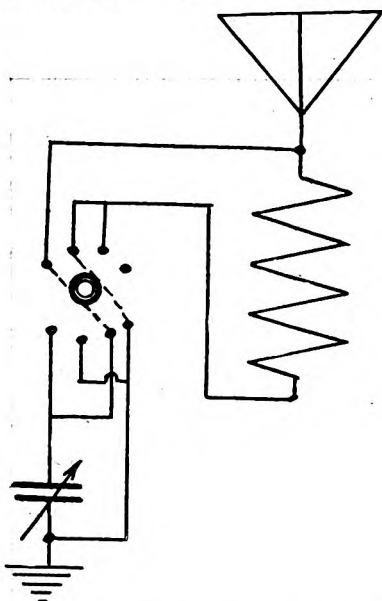
carries the insulating knob or handle. The purpose of the capacity switch is to insert a variable condenser into the primary-tuning circuit for either one or two reasons: to place the condenser in series to decrease the effective wave-length of the aerial-circuit; or, to place the condenser in parallel to increase the effective wave length of the aerial circuit.

The amateur living in the country, where open space is not at a premium, erects an aerial of 200 feet or more in length. He is quite correct in his belief that a long aerial will produce signals of greater strength, but he fails to consider that radiophone broadcasting, in which he is most interested, is sent on a wave of 360 meters whereas his excellent aerial has a fundamental wave length of 365 meters or even more.

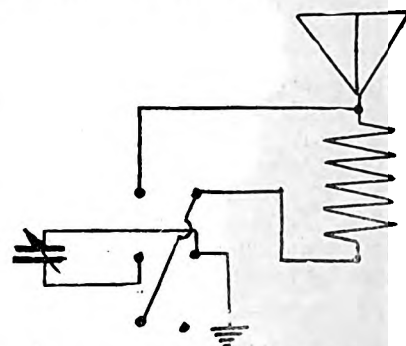
When this happens, the only possible move is to insert some capacity in series with the aerial. The aerial itself is like a huge condenser with the earth as the other conductor and the air between as the insulator, or dielectric. This, by placing a condenser in series with the aerial, produces an effect similar to two condensers in series. As most radio amateurs know, this condition, reduces the total capacity of the circuit.

But the opposite state of affairs is encountered, nowadays, even more frequently. The amateur finds that his aerial, plus the amount of wire on his tuning coil, is not sufficient to give him the requisite wave-length which would permit him to pick up a broadcasting station sending on 1450 meters. In this case, his easiest solution is some capacity in parallel with the aerial circuit. Wave length is the product of capacity and inductance. The latter is fixed by the tuning coil; but the former may be varied within certain limits.

Condensers hooked-up in series give the effect of a large condenser equal to the sum of both. Unfortunately for all, it is not possible to connect a condenser in parallel with the aerial.

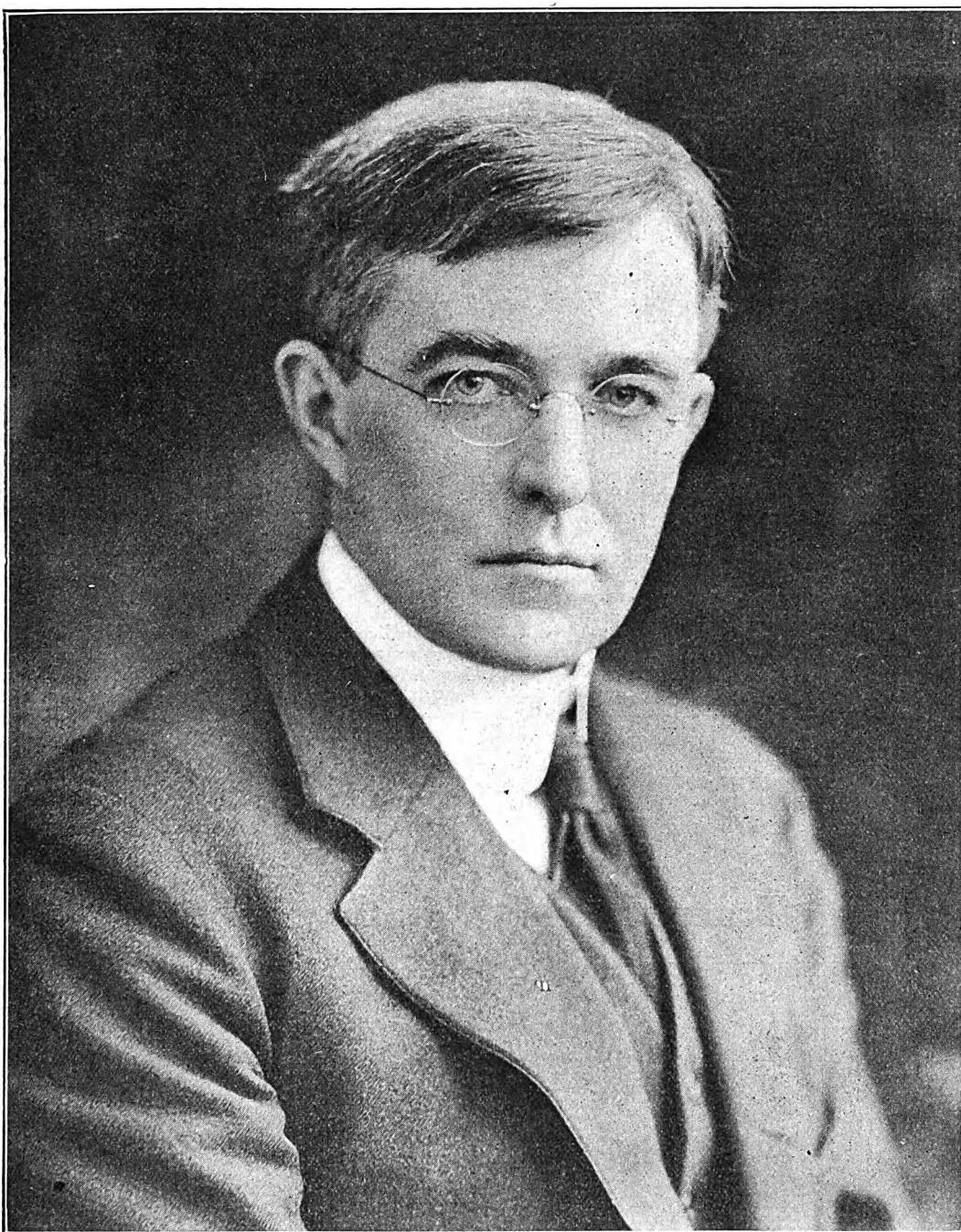


Hook-up of standard rotating capacity-switch. Dotted lines show position of blades when condenser is placed around (in parallel with) primary of variocomplex or other tuning device.



Hook-up to use when capacity is inserted by means of simple double-pole, double-throw knife switch.

Radio World's Hall of Fame



(Courtesy General Electric Company.)

Dr. IRVING LANGMUIR

Assistant Director, Research Laboratory, General Electric Co.

One of the younger geniuses in radio inventiveness. Educated in the public schools of Brooklyn, New York. Graduate of Columbia University School of Mines. Took a post-graduate course at University of Gottingen, Germany. Entered research laboratory of the General Electric Company, Schenectady, New York in 1909. Inventor of the nitrogen, or gas-filled, incandescent lamp; of the pilotron and kenotron—devices that are highly advantageous in radio and which are fundamental discoveries leading to the perfection of the Coolidge X-ray tube. Dr. Langmuir was presented with the Hughes medal in 1918, an award by the Royal Society of London, for his "Researches in Molecular Physics," and has twice been honored in being awarded the William H. Nichols Medal for "Arrangements of Electrons in Atoms and Molecules." He is now perfecting a twenty-kilowatt tube to take the place of gigantic plants.

Radiograms

Latest Important News of Radio Garnered from the World Over, and Reduced to Short Wave-Lengths for the Busy Reader.

ABOUT 350 active broadcasting stations are in operation throughout the United States. It is estimated also that the number of receiving sets will run up to the million mark. There is now about one station to every 3,000 sets and to every 10,000 square miles of population.

* * *

Radio is one "sport" that is not disturbing the churches. Many pastors throughout the country continue to report that it is doing more than any other modern agency to bring the church into the home.

* * *

Election returns at Portland, Maine, were broadcast recently with unusual success.

* * *

Mr. Charles D. Isaacson, of New York, recently sponsored a radio concert for the inmates of The Hospital for Insane, at Center Islip, New York, the largest institution of its kind in the country. The programme was the opera, "Cavalleria Rusticana." Nearly 3,000 inmates of the institution gathered in the auditorium, and a gigantic loud-speaker, built especially for the occasion, was installed. The music was heard with marvelous clearness and tonal quality. It came over the ether, fifty miles from WJZ, Newark, New Jersey.

* * *

It is said that no quieter or more attentive audience ever listened to an opera. Delight and astonishment illumined the faces of the inmates. Ninety per cent. of them had never heard of the existence of radio. Mr. Isaacson believes that he has demonstrated that music by radio will help the sick, the afflicted, and, particularly, the insane.

* * *

The summer home of the Church of the Heavenly Rest, Copake, New York, has been equipped with radio for use in its community work as well as for direct work in church affairs.

* * *

There is nothing difficult about learning code. It is just a matter of steady application and practise to acquire speed. The United States Navy cooperates with the amateurs of the

country to this extent: the naval stations actually send out code matter at a slow rate of speed daily for practice purposes. For instance: the Brooklyn Navy Yard, NAH, sends out code practice for amateurs every night. This begins immediately after NAH has completed its nightly program of news for ships. It sometimes starts at 9 o'clock; sometimes not until after 10. The start depends entirely on the amount of news matter to be sent out.

* * *

Several of the big London department stores have established radio departments and are selling receiving sets as low as \$10. Aerials are springing up on the roofs like mushrooms, and each day sees a legion of additions to the broadcasting which has so thoroughly captured the popular fancy. Direct contact with Arlington and other American stations is easily established.

* * *

The "Spoken Journal" has been "issued" in Paris. The editor, Maurice Privat, gathers his staff about him on a stage and, one by one, the members speak their "news or editorials." And, lo, radio takes their words to the waiting world.

* * *

Overseas Wireless Company of Germany has attained a new record. In one day, a total of 50,000 words were exchanged by radio at the stations of this company at Nauen and Eilvese. Two years ago, the entire business of this company amounted to only 100,000 words a month.

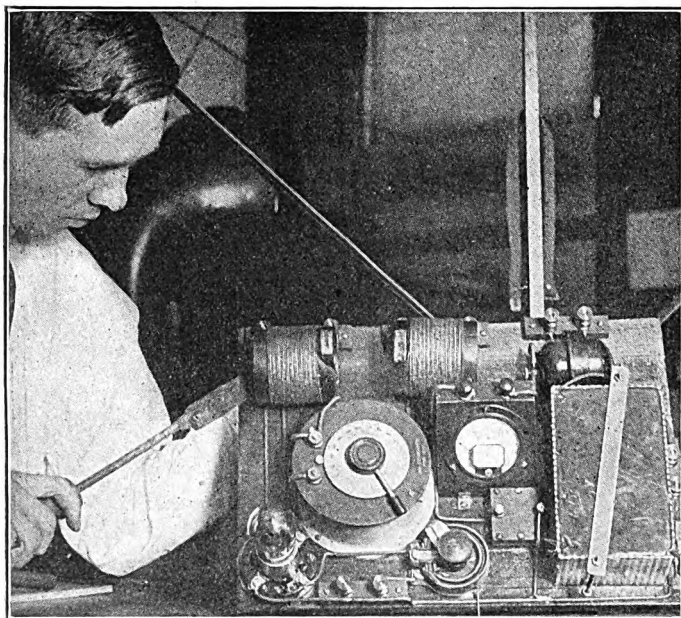
* * *

"The ordinary radio receiving-set involves about as much fire hazard as a white-enamel bathtub," according to W. S. Boyd, chairman of the electrical committee of the American Radio Association.

* * *

"Who knows?" says "The World," New York, "Their use as amplifiers in conjunction with the (Alexanderson) alternators may mean transatlantic telephone service before the snow flies." "The World" is referring to the 20-kilowatt tubes recently invented by Dr. Irving Langmuir of the General Electric Company.

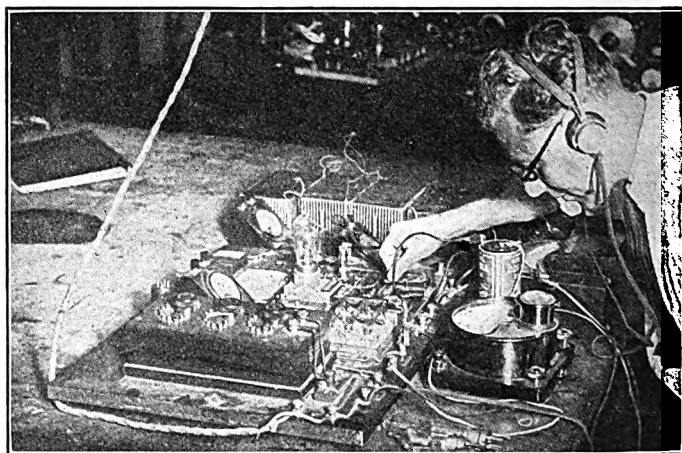
New Low-Power Transmitter



(C. Kadel & Herbert News Service.)

The above is a photograph of a low-power, 56-meter transmitter. Note the very small coils used. It is a very interesting set—a set that is intended for broadcasting on very short wave-lengths. It is a fact that no equipment has hitherto been devised for such a purpose, but busy minds are experimenting day and night to perfect new devices in radio. It is a fact, too, that what seemed a necessity six months ago has been replaced by newer, better, and more practical material.

Testing Tubes by Ammeters



(C. Kadel & Herbert News Service.)

Here is Samuel C. Miller, of the City College Radio Laboratory, whose keen knowledge of radio aided by his invention, the "Miller Bridge," enables him to keep tabs on all the radio vacuum-tube manufacturers in order to see if their output comes up to specifications. By means of his device, any defect in a tube may be detected. The "Miller Bridge," shown in the foreground, is a very sensitive ammeter which can measure currents as low as one-hundredth-millionth part of an ampere. It is used, also, to measure grid currents. The vacuum tube is one of the most vital parts of radio equipment. Without it, the new science practically would be helpless. A number of articles on this interesting little wonder have appeared in Radio World; but the subject is one that will always furnish food for clever pens. The vacuum tube is radio efficiency in the highest form of its potentiality.

Radio and the Woman

By
Crystal D. Tector

I HAVE been hard at it since we opened our bungalow here at Lake Hopatcong. Like all men, Friend Husband, wanted to get the cooking stove in order first of all; but I told him that he would go good and hungry if he didn't help me get the set in order before we even unpacked our bags. Well, he fussed and fumed—I wish you could have seen him! Said I wanted to starve him out, and all that sort of thing, so I did take pity on him and let him gnaw at a ham sandwich before I told him to get busy with what was first in my mind.

* * *

Not that Friend Husband isn't a good radioman. He knows a lot about it and can operate a set with the best of them; but I was a "bug" long before he ever thought there was anything in what he used to dub a "silly lot of nothing." I told him that there were people who thought Thomas A. Edison crazy when he announced the phonograph, forty-five years ago. F. H. would look at me and scowl and mutter something about "you women"; but I took it all cheerfully and now I have the laugh on him.

* * *

Well, we got the set in order, set up our aerials—strung from a peak of the roof to a tree—found a nice damp place for a ground, and, after dinner—I simply had to capitulate after all that—we listened in. It was wonderful how easily we picked up Newark. It was a splendid program. One song came over so clearly that it quite aroused our neighbors; and before we were aware of it, we had quite a goodly sized audience.

* * *

Even the county sheriff, who happened to be in the neighborhood, wafted in. He told me that he had been attracted by the "queer noise," as he called it, a quarter of a mile away. Said, too, that he had heard a lot about radio, but this was the first time he had ever "seen one workin'." He stayed so long that, I think, he must have neglected his constabulary duties. When I had him listen in for the time tick from Washington—telling him that he could then learn if his watch was correct—he was filled with more genuine surprise than I have seen since F. H. discovered that I am writing for RADIO WORLD.

* * *

The sheriff is a daily visitor. I am giving him special instructions in how to build a set. He is all enthusiasm. To-night, as I write this, he is to bring over his wife and family for an introduction to the mysteries and wonders of radio.

* * *

My mail has been particularly large this week. May I quote from a few of the letters?

Mrs. J. L. K., of East Orange, N. J., says: "What we need most—we who hear the programs every night—is more about advanced domestic science. That is what the up-to-date woman with a home is most interested in."

Miss Daisy L., Oklahoma City, Okla., writes: "I danced to radioed music the other night. My partner had the nerve to say to me: 'You dance much better since they put in ether music.' The nerve! I felt like answering him thus: 'If that is so, why don't you take it!' (I think that one is good enough for Mr. Mackay's colyum.)"

Miss H. Y. O., Dallas, Texas: "The other night we picked up a broadcasting station in Cleveland, O. We all felt that it was something worth recording as ours is only an amateur set. Anyhow it was a wonderful thrill."

Mrs. R. T. E., Evanston, Ill.: "We are the happiest family you ever saw since my brother perfected his radio set. We can hardly wait for night to come; and, the dinner over, sit about the loud speaker and listen—listen! Our ambition is to pick up some ship at sea."

* * *

Some day, I intend to write a book based on the many wonderful

Delights Radio Fans with Songs



(C. Underwood & Underwood.)

An exclusive photograph of Mrs. Laura Kincheloe, wife of the Congressman from Kentucky, singing in a Washington radio broadcasting-station to thousands of radio fans who nightly listen in to aerial doings. Mrs. Kincheloe is well known as a whistler of great merit, and is a prime favorite in the congressional set because of her entertaining qualities.

letters that I receive from enthusiastic radiowomen. Their missives are all so human and so full of heart interest. Do not fail to write me whenever you can. And if I can help you by a personal answer, I will gladly do so.

* * *

I took a long motor trip over the beautiful Jersey countryside yesterday. I was looking for aeralis, however, rather than at scenery. And I was agreeably surprised to see the number strung from the roofs of pretty hospitable homes. New Jersey, you know, is sort of a home for radio fans. It is truly wonderful how radio is booming in the schools—and among the girls as well as the boys.

Don't Miss the Next Issue of
RADIO WORLD

(No. 19, Dated August 5)

It Will Contain

The Armstrong Superregenerator

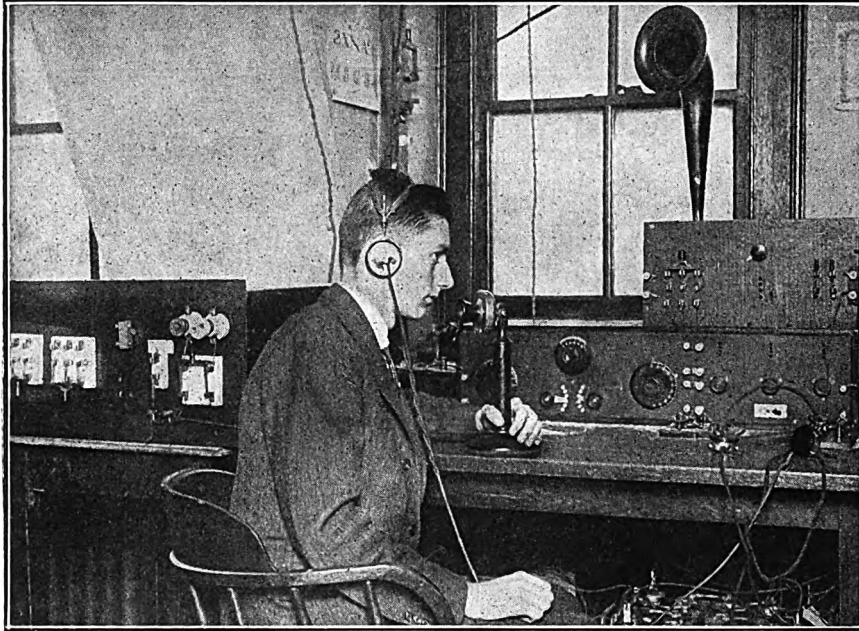
(Fully Explained)

By JOHN KENT

With Two Large, Complete Schematic Diagrams

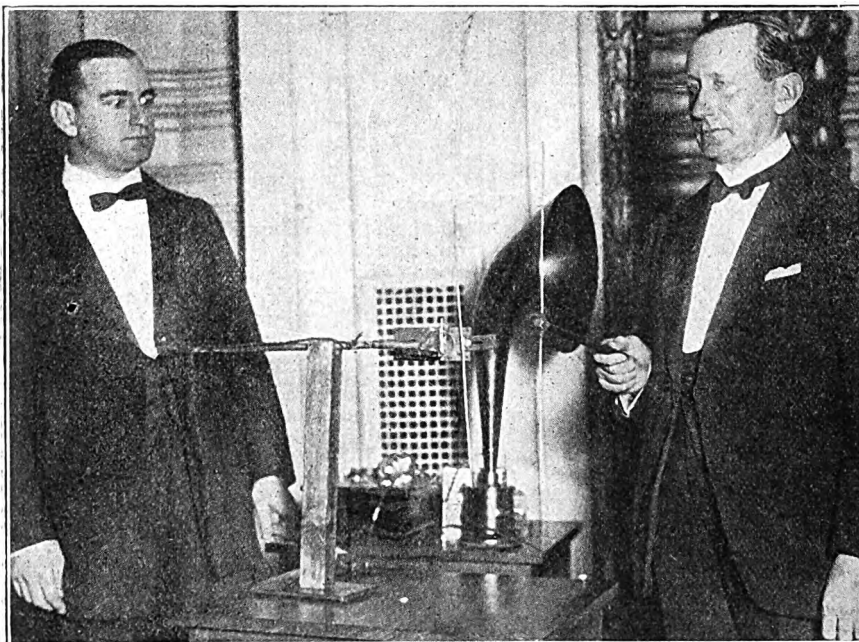


Radio Shows Remarkable Progress at



(C. Kadel & Herbert News Service.)

The above photograph shows a section of the radio room of the College of the City of New York. This station, better known in the radio field as 2XNA, has been heard by more radio fans than any other amateur radio station in the country. Richard Carlisle is shown talking by radiophone to 3BIJ, who is located in Virginia. The receiving equipment, at the right of Mr. Carlisle, was built by one of the students. It is a regenerative set carrying three steps of amplification. To the left is a home-made charging-unit, which keeps the batteries in trim so that communication is possible any minute of the day. The room is also equipped with a powerful transmitter.



(C. Kadel & Herbert News Service.)

At the left of the above photograph is Dr. Alfred N. Goldsmith, professor of engineering of the College of the City of New York. At the right, Senatore Marconi is explaining his directional radio waves. Dr. Goldsmith, himself an inventor of eminence, has done heroic work in advancing the interest in radio among the student body at the big college of the world's greatest metropolis. Dr. Goldsmith was one of the first men to realize that radio will be one of the great commercial elements of the future, and to this end he advised young men to prepare for it. He has enthused and guided them, and the student body at the C. C. N. Y. look to him to keep them abreast of the steady advance in the new science. In his own laboratory Dr. Goldsmith has performed some remarkable experiments, and he has even picked up messages broadcast from Nauen, Germany, which any radioman may be proud to have to his credit.

THE College of the City of New York now boasts one of the most progressive radio clubs of any institution of learning in America. Its call is 2XNA. The club has managed to establish a healthy modicum of brotherly love among its members, and the result is a large number of interested radiomen who will do much to elevate and advance the new science.

2XNA is under the supervision of a licensed operator capable of handling twenty words a minute. The club maintains an efficient radio station. Code is taught and the atmospheric reputation of the student is carefully developed.

The College of the City of New York also maintains a laboratory for the use of students in radio engineering. Dr. Alfred N. Goldsmith, inventor and radio expert, is the head of this class. The engineering students conduct an evening class for the benefit of beginners. The set installed consists of three 50-watt tubes, making a total of 1,500 watts. Several hundred miles have been reached successfully. Under normal weather conditions, a thousand miles may be reached.

In order to measure up to its progressiveness the club has outlined a fall program of improvements. Some of the more important items are as follows:

A loud speaker is to be installed in the Concourse to advertise current college-activities and announce the world series.

Cabinet Member Radios

(Right) Postmaster-General Work, who stopped his busy program at Washington so this photograph might be taken, is one of the busiest radio fans in the United States. Mr. Work uses radio as a means of speeding up his department. It is remarkable what the United States Post-office can find to broadcast. It has a continuous program to be sent out, and it must be sent with accuracy and dispatch. It will not



(C. Underwood & Underwood, N. Y.)

be long, it is reported, before capital will be equipped with

College of the City of New York

Due to the success of the recent radio-chess match, arrangements are to be made to play other institutions.

The passageway between the radio and physics towers will be fitted out completely as a code practice room. It is expected that a class of a hundred will be enrolled, each student being on the job two or three hours a week. A definite schedule will be adopted, club members being the instructors. A chart of code speed will be kept from month to month.

An Armstrong superregenerative receiver will be installed.

Expert members are to do night-operating duty. Schedules to be made with DX stations.

A new transmitter will be constructed using four 50-watt tubes with a plate potential of 1,000 volts.

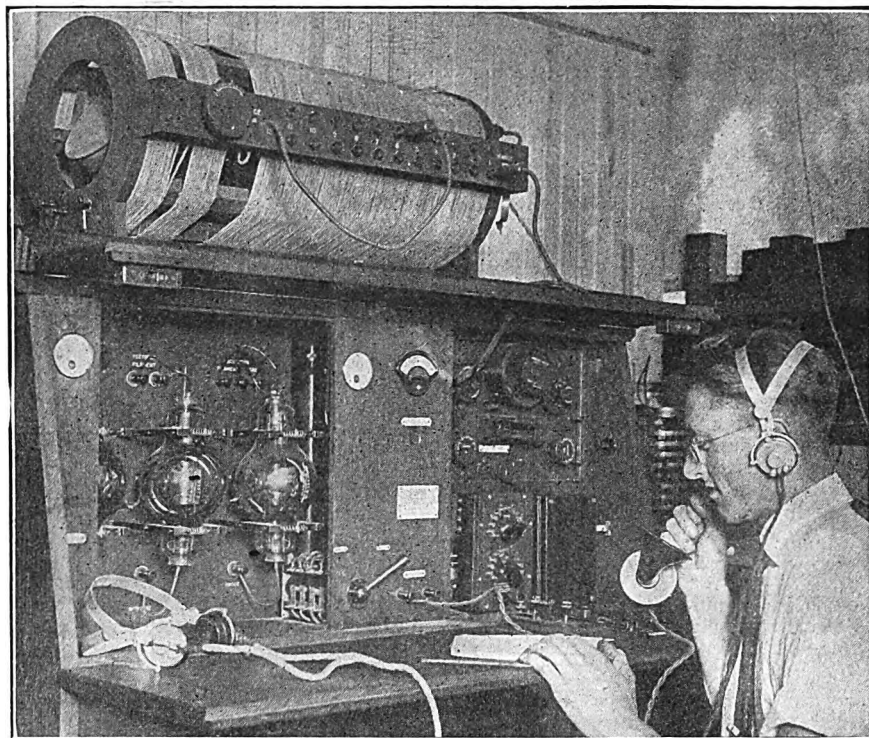
Only members of the operating committee on schedule may operate the transmitter. These men must do at least twenty words a minute.

There will be a radio lecture every week. If a speaker of prominence cannot be secured for each week the club will assign topics of varying technicality to the more expert members, who will talk on whatever subject with which they are most familiar. The subjects will alternate between elementary and advanced matters, so that both inexperienced members and veterans may be benefited.

The club room will be artistically decorated in harmony with its purpose.

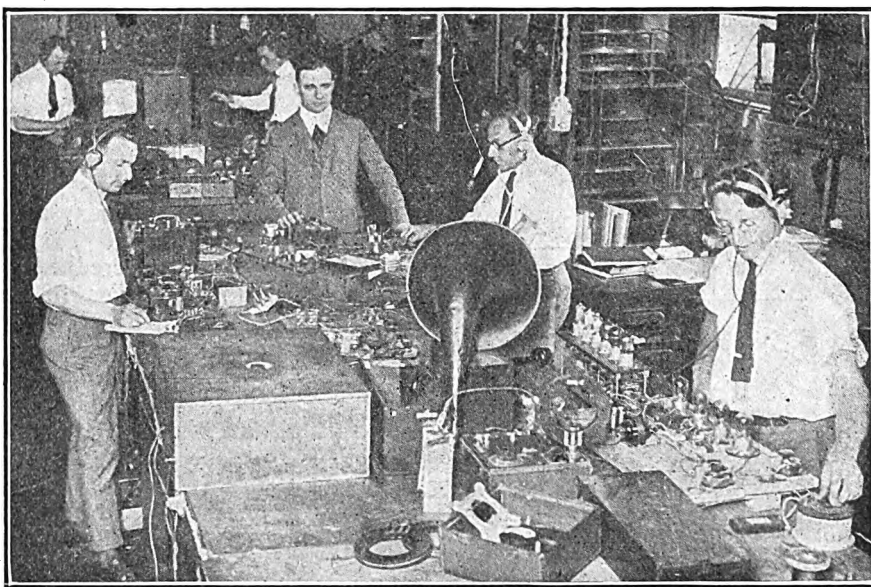
The members go up to the club rooms on schedule; they will continue to sign the roll on leaving. The great bell will be rung by wireles time every day.

Last year's radio term proved unusually successful for the C. C. N. Y. The membership was more than double. The copying speed was noticeably advanced. All of the radio activities were operated by a thorough system.



(C. Kadel & Herbert News Service.)

This illustration shows the large radio-tube transmitter located in the College of the City of New York. It is claimed that this is the largest tube-set ever installed for amateur operation. Its capacity takes in three tubes of 50 watts each, totaling 1,500 watts, or one and one-half kw. Abraham Ringel is photographed talking to a steamer several hundred miles out at sea. The transmitter is enclosed in a cabinet, permitting any serious adjustment to be made at the shortest possible notice. The large coil on top of the cabinet is a tuning inductance. It is used for tuning various wave lengths. To the right in the cabinet is the receiving equipment.



(C. Kadel & Herbert News Service.)

Every amateur who owns a radio set does some experimenting during his leisure hours and finds some improvement that may be made in his set. This enables him to grasp some of the principles of radio communication. Yet there are some experiments which would tend to show that some principles of the art are lacking, due either to some technical equation being too deep for him to understand or for some reason of circuit. The College of the City of New York maintains a laboratory where experiments are made in all such interesting technical matters. In this photograph Dr. Alfred N. Goldsmith is shown conducting a class in research engineering, experimenting with various circuits. The laboratory is well equipped, as may be seen. At the testing-table engineers are testing out vacuum tubes for the proper functioning of the circuits. This laboratory carries every known instrument that the research engineer requires.



Every Government department in the nation's transmitting and receiving sets.

Answers to Readers

Can a loading coil be used to increase the wave length of a loose coupler or variocoupler?—Robert Devita, Los Angeles.

A loading coil can be used, but you must load up the secondary as well as the primary. If a tuned-plate circuit is used that also must be loaded in proportion to the primary load.

* * *

In making up a spider-web coil, how many turns are required for primary, secondary, and tickler?—Thomas Malon, Syracuse, N. Y.

The primary requires about 35 turns, secondary about 50, and the tickler about 50. In employing these coils use a primary series condenser of about .001 mfd. capacity, and a secondary condenser capacity of .0005 mfd., capacity.

* * *

In using crystal detectors, which is our best: Galena or carborundum, using the carborundum with an applied external voltage?—Ernest Metler, Brooklyn, N. Y.

Galena is usually the most sensitive crystal, although carborundum is more dependable for short-distance work. It also retains its adjustment.

* * *

I would like to purchase a receiving set on the installment plan. Do you know of any concern selling on this plan?—Peter McIntosh, Rome, N. Y.

RADIO WORLD does not know of any firm selling sets on the installment plan.

* * *

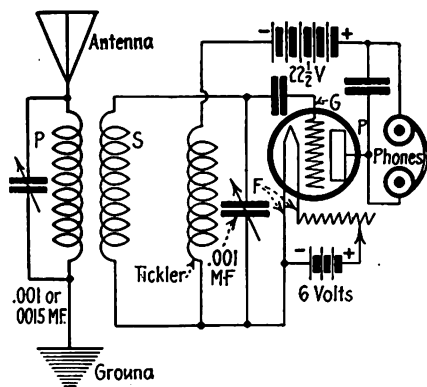
I am making a variometer set, using two variometers, one for the grid and one for plate circuit. Can I make a variometer that will tune up beyond the broadcasting stations—say, about 1,500 meters?—Paul Shaefer, Chattanooga, Tenn.

A variometer of this size is not practical, as it is too cumbersome to operate. Make a honeycomb-coil set. Then you can reach almost any wave desired by simply changing coils.

* * *

In using a tickler-coil circuit consisting of a coupler with movable tickler, using vacuum tube and condensers, what would be a good hook-up to work from?—Joseph Sercak, Marion, Ohio.

The accompanying schematic diagram gives you full wiring data for the circuit. Wire accordingly. This is the Armstrong



regenerative circuit. Excellent results should be obtained when completed.

* * *

I have read several interesting articles on radio frequency by George W. May, R. E., in Radio World. Could you advise me who manufactures these; or, were they specially designed by Mr. May?—John Wiley, Richmond, Va.

Anyone wishing to experiment with radio frequency according to Mr. May's ideas should write to him in care of this office. We will forward the letters.

New Radio-Equipped Lightship



(C. Kadel & Herbert News Service.)

Blows and seas off Hatteras will have to be record ones to displace the new lightship stationed off Diamond Shoals. She is the newest and largest vessel in the United States Lighthouse Service. No. 105, as the ship is listed, was built to replace No. 72, which was sunk by a German submarine on August 6, 1918. The vessel is red in color and bears the name "Diamond" in large white letters on each side. She shows a flashing light at the foremost head, the illumination being acetylene gas controlled by an electric flasher operating the gas burners and giving it a characteristic flash distinguishing it from other lights on the neighboring coast. The vessel is 147 feet long, has a displacement of 825 tons, and can be driven by a compound-engine with an indicated horsepower of 400. She is equipped with three distinct fog signals, a steam chime whistle, a submarine bell, and an automatic fog-signal. No. 105 is the latest lightship to be equipped with the radio signal.

The Truth About Electric Lamp-Socket Aerials

By Harold R. Hart

CONSIDERABLE interest has been created by several lamp-socket aerials that appeared recently. However, there is much confusion in the minds of many amateurs over this type aerial.

Its existence must be credited to Maj.-Gen. George. O. Squier, of the United States Signal Corps. The ordinary aerial and the lamp-socket aerial act as two separate aerials. It must be remembered, when using a lamp socket as an aerial, that one must apply 110 volts to the terminals of the socket. This means that there are 110 volts at the terminals. Until broadcasting stations see fit to transmit their programs over these electric-light power lines, this lamp-socket invention, which acts as an aerial, will have no direct application to amateur reception; but using electric-light wires as an aerial, for radio reception, it is possible to secure results.

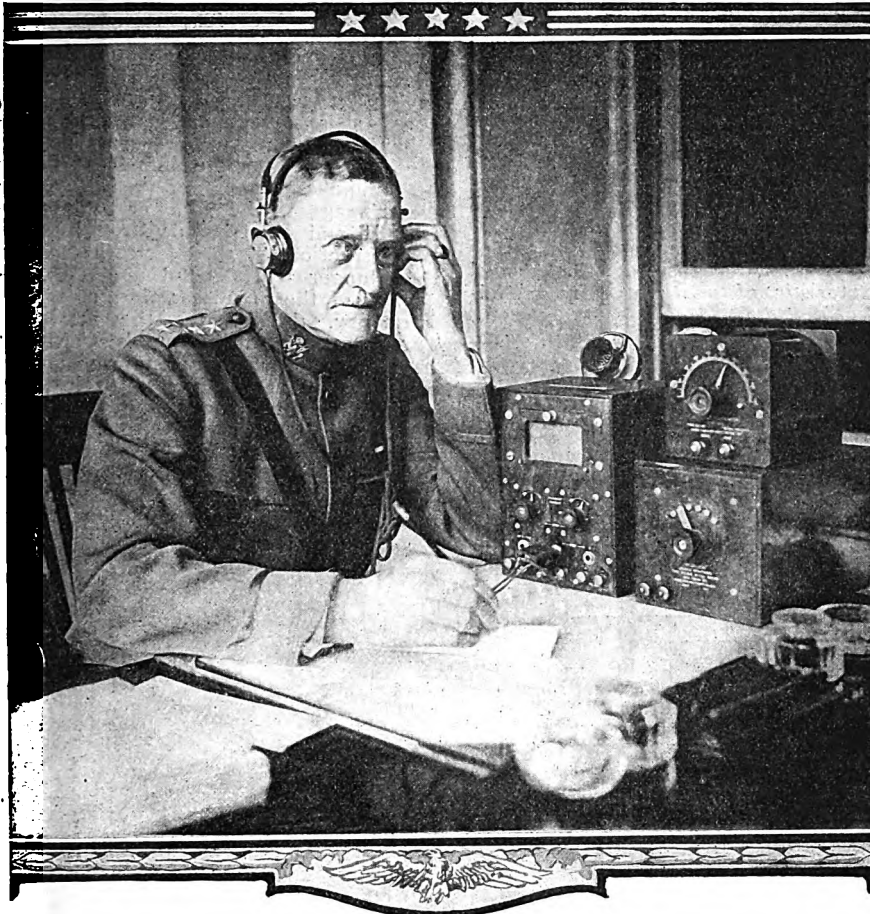
The elimination of the outside aerial is now possible, and the amateurs who have the lighting power in their homes may hear the daily program of the various broadcasting stations by attaching a plug to any lamp socket.

But certain care must be maintained in order to protect the set from mishap. One factor is necessary: a good plug. The plug must be perfect electrically; that is, perfect in such a manner that it will stand up under high voltages without heating or breaking down; and in order that any person may handle it without producing a short circuit, the plug should be well protected. An ordinary separable attachment plug is used, one with two blades connecting the separate halves of the plug. Only one wire is run from the plug, the other binding-screw is left undisturbed. This single-conductor wire should be long enough to reach from a handy electric-light socket to the table on which the instrument is placed.

Between the lighting wires and the apparatus we must insert a condenser either of the oil or air type. This is very essential for two reasons: first, in order to keep the current from your instruments; second, to effectively reduce the wave length of the lighting wires, which are exceptionally long, so that it is possible to carry on the

(Continued on next page)

Chief, also, of Army Radio Fans



(C. Underwood & Underwood, N. Y.)

General John J. Pershing, U. S. A., is head of the great army of fans in the United States Army, as well as ranking officer of that branch of the service. Radio is to play a big part in future army affairs, and General Pershing, who is keenly aware of this, watches every little change in the improvements that are being made daily in all branches of radio. He believes in its usefulness as a powerful army accessory.

(Continued from preceding page)
shorter wave-lengths from the broadcasting stations.

In order to assure constant service and freedom from buzzing from the alternating-current circuit, the plates, and dielectric in the condenser should be so compressed and held together that it is impossible for them to expand, or enlarge, when placed under an alternating current. No set should ever be used on this system without the aid of condensers in the aerial, or ground circuit, the aerial circuit being preferred. Another help to the amateur will be to insert, just prior to the antenna connection on his set, in series, a one-half ampere fuse, which will protect and benefit the set considerably. One may wonder how this set would work if the condenser were even placed in the ground circuit; but in such a case the whole antenna would then work on the principle of a loop aerial.

In case an externally connected condenser is used, the circuit should be run from the fuse to the condenser and from the condenser to the antenna

binding-post of the receiving set. In some cases where the condensers are built right in the set, the connection from the set is run directly to the antenna binding-post.

Screw the attachment plug into the electric-light circuit and tune as usual. These plugs have proved quite successful and in a majority of cases, will work as successfully as the regular type of aerial—sometimes even better. condenser must be chosen to suit the In order to get satisfactory results, the particular line from which you wish to operate your set.

When using your set, if no signals are heard, simply reverse the bottom half of the plug. Amateurs endeavoring to use a lighting system as their aerial, should never hook-up direct to the lighting system without employing a means of safety, such as a condenser. Where no condenser is used, the fuses will be blown and the house left without light. Precaution should also be taken so that no body contacts are made with the power lines and the ground at the same time. Plugs purchased should be bought adjustable.

Encourage your boys to own a MAGNAVOX Radio



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a Wireless Telephony Age

YOUR boy is living in the dawn of a new day!

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Thanks to the Magnavox Radio, any receiving set will now serve the entire family—reproducing loud and clear the splendid programs broadcasted daily in all parts of the country.

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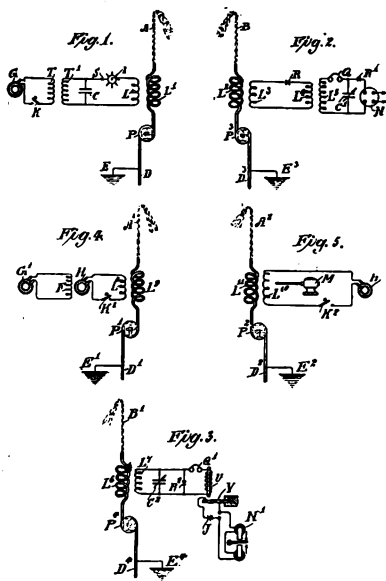
Radio Patents

RECENTLY ISSUED

Electric-Wave Transmission With a Fluid Antenna

No. 1,420,254. Patented June 20, 1922.
Patentee: John Hays Hammond, Jr., Gloucester, Mass.

MR. HAMMOND intends that this invention will employ liquid, or gaseous, elements to replace the usual solid type of antenna used for transmitting and receiving in radiotelegraphy and radiotelephony. It relates more particularly to a method for utilizing such



Schematic design of the Hammond invention to replace the ordinary antenna with liquid or gaseous elements.

liquid and gaseous antennae in a practical way. The idea of using a liquid, or gaseous, antenna with the ordinary method of tuning by means of wave frequencies in radiotelegraphy is not new; but it is obvious that in any kind of a wind, and also owing to other causes, the capacity of either a liquid, or a gaseous, antenna would be continually changing; and as the frequency of the waves emitted from an antenna depends on the product of its inductance and capacity, it follows that, by the ordinary method of tuning, resonance between transmitting and receiving antennae would be impossible."

Mr. Hammond also hopes to make possible tuning by wave-group frequency, so that changes in the wave length of the waves emitted and received will not affect the selectivity between station.

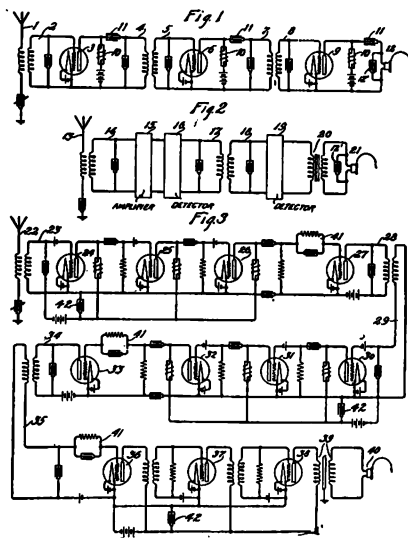
Radio Receiver Employing Multiple Detection

No. 1,420,055. Patented June 20, 1922.
Patentee: Harold W. Nichols, Maplewood, N. J.

THE primary object of Mr. Nichols's invention is to provide a means whereby a current of low intensity will not be affected by a strong interfering wave of frequency. Another object is

to provide means for eliminating interference due to a current of large amplitude colliding with a current which a person may wish to receive.

In this system, advantage is taken of the fact that, because of the curved characteristic of most detectors includ-



Schematic design of the Nichols invention to prevent high frequency from interfering with low intensity.

ing the vacuum tube type, if a speech or other signal-modulator carrier-current is impressed on its input circuit, there will be present in the output circuit the signal modulated first even harmonic of the carrier frequency; and by tuning the output circuit of the detector and the coupled input circuit of the next detector to his first even considerable harmonic selectivity will be obtained.

When a receiving station adapted to co-operative with a low-power, or "weak" transmitting, station receives energy from a high-power, or "strong" transmitting, station interference results, the measure of which is determined by the intensity of the signal current received from the "strong" station relative to that from the "weak" station and to some extent upon the relative frequencies of the waves radiated from the two transmitting stations.

Therefore, when two such stations employ frequencies which are close together on a percentage basis, i. e., the ratio of the frequency of the interfering to selected waves is large or that of the difference frequency relatively to that of the desired waves is small, selection at the receiving station of the signal currents radiated from the "weak" transmitting station is extremely difficult with the arrangements heretofore devised.

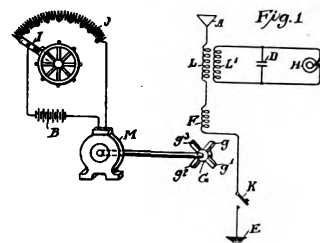
A System of Distant Control

No. 1,420,256. Patented June 20, 1922.
Patentee: John Hays Hammond, Jr., Gloucester, Mass.

THIS invention relates to systems for the control of mechanisms at a distance by means of radiant energy, and relates more particularly to sys-

tems in which radiant energy transmitted from a distant station actuates electrical receiving apparatus, which causes the operation of mechanisms worked by fluids under pressure.

"I have discovered that when a series of wave impulses is sent out from a transmitting station," says Mr. Hammond, "the position of a plunger, or movable core in an electromagnet, at a receiving station, can be controlled by the frequency of the impulses. When no impulses are received by the electromagnet, the plunger is not attracted, and when impulses are received, the attraction of the electromagnet for the plunger will depend upon the frequency of the impulses; the greater the frequency, the greater the attraction. The frequency of the impulses sent out from the transmitting station can be controlled in various ways, for instance, by sending out a continuous train of waves and then varying the amplitude of the waves by changing the inductance or the capacity of the antenna circuit at



Schematic design of the Hammond invention to control mechanism at a distance by means of radio.

any frequency desired. The electric waves may also be sent out in groups, and the group frequency varied."

In any of these ways the attraction of the electromagnet for its plunger may be varied, and hence the position of the plunger can be controlled, and any mechanism attached to the plunger can likewise be controlled.

* * *

Old Schooner a Radio Station

THE Country Club of Sturgeon Bay, Wisconsin, has put an odd radio station in operation. The club, in constructing a new pier for its grounds made use of the hull of an old lumber schooner, the "Mary Ellen Cook." This craft formerly sailed between Chicago and Marinette and it carried building material for the homes of many old-time Chicagoans.

The hull was rebuilt and painted white, but many of the parts that distinguish the old craft were left intact. The hull was sunk at the site of the pier and will be used for dock purposes only. Between the original masts of the schooner an aerial will be stretched and below will be installed one of the best radio outfits. Club members will be privileged to sit on the old deck and listen to the broadcasting.

DEALERS

Have you our price list?
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Everything for radio

RADIO ACCESSORIES CO.

228 West 42nd Street, New York

Broadcast Bill's Radio- lays

By William E. Douglass
(Copyright, 1922, Westinghouse Electric
& Manufacturing Co.)

SISTER'S come to visit us and spend a week or two, to help my wife put up some fruit, an' then when that is through, she's goin' to do some sewin' fer my wife an' fer herself, so they can get themselves dolled up fer Harvest Home, the twelfth. In evenin's when they're sewin', after Willie's gone to bed, I get my wireless set hooked up an' harness on my head, or sometimes when it's good an' loud I put it on the horn so wife an' sis can hear the price of hogs an' wheat an' corn. Last week sis



"Everything wuz lovely by the time that sis come down"

met a feller an' he cum around to court, I entertained him better, heaps, than openin' up a quart. When he wuz sittin' in the parlor waitin' Wednesday night, young Bill got started talkin' an' he queered the party right. "What's them," he sez to sis's beau an' opened up his hand an' showed him something white that we all thought at first wuz sand. "They're beans," said sis's beau an' Willie turnin' to his maw, sez, "See, he knows 'em, maw, you said he didn't know beans at aw'." I tried to change th' subject an' start talkin' 'bout the crops, but all the time I notices sis's beau wuz mad as hops. So, I turned on the wireless an' we heard some vaudevil, but fer a time I'll tell you everything wuz pretty still. Then one of them comedians pulled off a funny joke that seemed to tickle sis's beau, well gosh, I thought he'd choke. Well, everything wuz lovely by the time that sis cum down, I hope that he'll forget the beans on th' way into town.

The "Radio Fixer" Here

THE radio aerial repairman is here. Not to be outdone by those reaping the shekels in this golden age of radio, the line-man has merged a new job with his former remote occupation of repairing clothes lines in backyards, says "The Sun," New York. For a small sum he repairs your radio aerial which may have downed during a storm.

"In some blocks I make more money fixing aerals than repairing washlines," he said. "The work is simple compared to climbing lines poles, and much safer. And you don't have to know a lot about science to fix the wires."

Latest broadcasting map 15c. That is, a complete broadcasting map appeared in Radio World, No. 8, dated May 20. Mailed on receipt of 15c. Radio World Company, 1493 Broadway, N. Y. C.

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At \$1.00 per Roll

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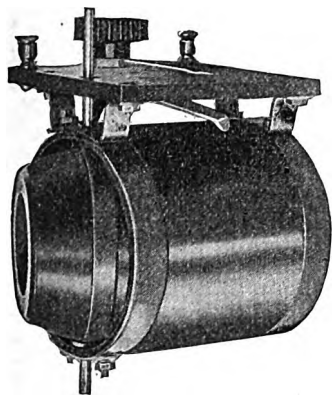
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Write for descriptive circular and
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QUESTIONS and ANSWERS

Ask RADIO WORLD any questions about Radio. Subscribers are answered in next week's issue. New wonders of the marvelous wireless illustrated and fully described in each weekly issue. All newstands at 15c a copy. Subscriptions, 3 months, \$1.50; six months, \$3.00; one year (\$2 numbers), delivered to your home, \$6.00. RADIO WORLD, Room 226, 1493 Broadway, N. Y. C.

To many anxious inquirers RADIO WORLD has no free list. One copy is sent as a voucher to each advertiser or advertising agent represented in current issues. All other copies are paid for on subscription or through the news trade.

Latest broadcasting map, 15c. That is, a complete broadcasting map appeared in RADIO WORLD, No. 8, dated May 20. Mailed on receipt of 15c. Radio World Company, 1493 Broadway, New York City.

Marconi Will Experiment with American Material

WHEN Senatore Guglielmo Marconi sailed from New York on his radio-equipped yacht, "Elettra," he took with him much American wireless material to be used largely in telephony. Among this material were some of the new electron tubes, called radiotrons in this country, which have been developed at the General Electric Company by Dr. Irving Langmuir for use in both wireless telegraphy and telephony. The new tubes are of 20 kilowatts. One-kilowatt tubes have been used by Marconi on the "Elettra," and the four-kilowatt tubes in some of his experiments on land. Senatore Marconi also took a wireless telephone set and amplifier, to be used for the reception of broadcast programs.

While he was in this country, Marconi gathered the opinions of American radio engineers as to how he could further his experiments with short-wave telephony, and that will be the first scientific problem he will undertake when he arrives in Europe. Some of his men are now out on the vessel, "Pharos," conducting experiments on short-wave telephony, and it is probable that Senatore Marconi will join them. He has already talked about ninety-nine miles over land by use of his short-wave system.

Governmental Committee Submits Schedules

THE recently organized interdepartmental committee has advised Secretary Hoover regarding the priority of government material to be broadcast and has submitted schedules of operation.

The committee recognizes that radio must be used primarily for types of service that cannot be as satisfactorily conducted by other means of communication, and, therefore, radio broadcasting should not be used in general where wire telegraphy, or telephony, or printed publication would be as satisfactory. The scope of the Committee's activities may be extended in an advisory capacity to the Secretary of Commerce in matters of government radio-regulation and considering all radio questions of interdepartmental interest.

Eight existing governmental stations designated as primary stations for the transmission of daily news and information include Naval stations at Arlington and Great Lakes, Post Office stations at Washington, Omaha, North Platte, Rock Springs, Elko, and Reno. The material sent out may be rebroadcasted by other stations licensed as "limited commercial."

Radio in Apartments

So keen is the desire of the engineers of the various manufacturing companies to simplify the operation of the receiving sets, that it is quite likely that many of the apartment houses now building in New York City will have both aerial and current source installed, making it necessary merely to press a button or turn a switch to get the concerts. Even phonograph operation will seem hard compared to this.

RADIO WORLD

TELEPHONE, BRYANT 4796
PUBLISHED EVERY WEDNESDAY (Dated SATURDAY OF SAME WEEK)
FROM PUBLICATION OFFICE,
1493 BROADWAY, NEW YORK, N. Y.
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ROLAND BURKE HENNESSY, Editor and Publisher, 1493 Broadway, New York.
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Robert Mackay Fred. Chas. Ehlert

SUBSCRIPTION RATES

Fifteen cents a copy. \$6.00 a year. \$3.00 for six months. \$1.50 for three months.

Add \$1.00 a year extra for postage to Canada and foreign countries.

Receipt by new subscribers of the first copy of RADIO WORLD mailed to them after sending in their order, is automatic acknowledgment of their subscription order.

Advertising rates on request.

Entered as second-class matter, March 23, 1923, at the Post Office at New York, New York, under the act of March 3, 1879.

IMPORTANT NOTICE:

While every possible care is taken to state correctly matters of fact and opinion in technical and general writings covering the radio field, and every line printed is gone over with a scrupulous regard for the facts, the publisher disclaims any responsibility for statements regarding questions of patents, priority of claims, the proper working out of technical problems, or other matters that may be printed in good faith and on information furnished by those supposed to be trustworthy. This statement is made in good faith and to save time and controversy in matters over which the publisher cannot possibly have control.

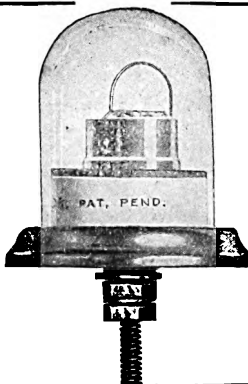
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as illustrated costs you only \$2.00. Used the country over by thousands of Radioists. Always set and ready, fully protected from dust and dirt, gives the best results.

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American Radio Products Find Ready Foreign Markets

NO product of electrical manufacturers has ever taken the world so by storm as has the radiotelephone receiving-set, according to a statement made by the Electrical Division of the United States Department of Commerce. All over the globe broadcasting stations are daily disseminating news, music and commercial information to many thousands of radio enthusiasts.

Outside of a few countries where existing political conditions have imposed restrictions, the use of radio is being taken up universally. The development has been most rapid in this country. In Europe, South America, Australasia, and, to some extent, in Africa and Asia, broadcasting stations are being installed, with a resultant increasing demand for receiving sets.

Notwithstanding an enormously increased manufacturing capacity, makers of radio equipment are still behind on their domestic orders, and this, naturally, has limited their interest in export trade. Nevertheless, the total value of wireless equipment shipped abroad during the first five months of this year is more than 60 per cent. of the total for the calendar year, 1921, and the inquiries from abroad have increased considerably. As productive capacity here catches up with the domestic demand, a strong export trade may be expected.

Due to the volume and the variety of the home demand, American manufacturers have developed simple, compact, efficient, reliable, and economically priced receiving sets, which should take well abroad. As an indication of the interest shown by foreign buyers, one manufacturer reported a few days ago that, as a result of circulars recently sent to a number of London electrical importers, he had already received two inquiries by cable.

As an interesting feature of the sales abroad, for several months there has been a considerable call for receiving sets from our neighbors on the north and south—Canada, Cuba, Mexico and Central America—where radio "fans" found that tube sets would permit them to readily listen in on some of the important American broadcasting service.

No Interest in Stocks Until Quotations Were Broadcast

TORONTO, Canada.—Simons, Agnew & Co., Toronto, members of the Standard Stock Exchange of this city are now regularly broadcasting the Canadian mining-share market to their correspondents throughout Ontario, at intervals of one hour. The plan, it is said, is productive of a large increase in business on the Toronto Board. While activity at the hundreds of Ontario mines this year has been more marked than ever before, the public appeared to take no interest in the stocks of the

various companies until the broadcasting of quotations was inaugurated. From a volume of a few thousand shares a day on the local exchange, two weeks ago, transactions have rapidly increased until half-a-million share days are now the regular order. A remarkable feature of the innovation is that it has brought a vast amount of business to the exchange from the mining regions, most camps now being equipped with at least one receiving-set. Many of the mines are located hundreds of miles from Toronto and at isolated points long distances from railroads and telegraph offices.

Cleveland's Next Show

THE success of radio expositions held in New York, Chicago, Detroit and other large cities have proved to the manufacturer, distributor, and dealer in radio equipment the benefits to be derived by exhibiting and demonstrating their products, and educating the public in the rapid strides this industry is making. Cleveland is the next large center to fall in line—a huge display is being organized to be held in the Cleveland Public Hall, August 26 to September 4, inclusive.

Prizes will be awarded to students in both grade and high schools for the best homemade radio-receiving sets displayed. The technical schools of Cleveland will be represented, and there will be feature exhibits and demonstrations which will give the public a liberal education in radio and its branches. No rental charge is being made for the display space and firms wishing to exhibit are being allotted their space in the order in which applications are received.

Pittsburgh's Radio Day

THE Radio Engineering Society of Pittsburgh held its monthly meeting last week at Hotel Henry, Pittsburgh. Dr. Omar T. Cruikshank, presided, and a large number of members were present. The discussion centered about the coming big radio event known as "Pittsburgh's Radio Day." This event will be held in West View Park, August 24th. The attendance will not be limited to club members. All radio enthusiasts are invited. There will be a large number of radio demonstrations and exhibitions of radio apparatus. Various radio novelties will be donated and everybody will be given a chance to take home a radio-set by winning some of the prize athletic and aquatic events. A radio dance will be a special feature.

Radio Dealers' Directory

Realizing the great need of a reliable directory of radio dealers throughout the country, Sydel's Radio Directory and Service, 555A Schenck Avenue, Brooklyn, New York, is now offering such a list to the radio trade. It is arranged in card-catalogue form and is annotated to indicate exact class, as "Exclusive," etc.

Fifty-two issues for \$6.00. Sub. Department, Radio World, 1493 Broadway, N. Y. C.

New Firms and Corporations

Notices in this department are considered as purely interesting trade news and published without compensation to us. We welcome trade news of this nature. All notices having an advertising angle are referred to our Advertising Department, and are placed under Classified Advertising at 5 cents a word, or as Display Advertising at \$5 an inch.

(The firms and corporations mentioned in these columns can be reached by communicating with the attorneys, whose addresses are given whenever possible.)

Dickinson Electric & Mfg. Co., 114 South Race St., Urbana, Ill. Mr. H. C. Dickinson writes: "We are incorporating for \$100,000 and are manufacturing a first-class line of parts and sets, including wooden and moulded variometers and varlocouplers, radio and audio-frequency transformers, variable and fixed condensers, standard binding posts, short and long wave, one and three-circuit regenerative receiving-sets, one and two-stage amplifiers, and other miscellaneous parts."

Gearhart's Pharmacy, Hopkinton, Iowa. Radio sets and supplies. N. A. Gearhart, manager.

Driscoll Mfg. Co., Brooklyn, to deal in auto accessories and radio products, \$50,000; J. F. Driscoll, L. M. Baer, A. Levy. (Attorneys, Goodman & Werner, 51 Chambers St., N. Y.)

Racony Corp., Manhattan, deal in radio appliances, \$20,000; N. Roznikoff, F. Lewin, A. L. Hecht. (Attorneys, S. Rubin, 120 Broadway, N. Y.)

Hennessy Radio Publications Corp., Manhattan, \$100,000; R. B. and M. B. Hennessy, F. S. Clark. (Attorney, A. Dreyer, 1482 Broadway, N. Y.)

Wiener Wireless Specialty Co., Newark, wireless enterprise, \$100,000; Nettie J. Wiener, Louis Lefkowitz, Louis Wiener, Newark, N. J.

Standard Wireless Corporation, Hempstead, Nassau County, \$10,000; H. Lindquit, A. H. Buck, F. D. Burroughs. (Attorneys, Edwards & George, Freeport, Long Island, N. Y.)

Mortimer Radio Corp., Manhattan, \$50,000; M. L. Newman, L. Levy, A. Birnbaum. (Attorneys, Price Bros., 261 Broadway, N. Y.)

United Electrical Supply Co., Newark, \$125,000; Isadore Siegel, William Gross, Henry Siegel, Newark, N. J.

Williams Battery Co., deal in batteries, electrical machinery, \$3,000,000; A. H. Williams, T. J. Town, J. H. Phillips, Philadelphia, Pa. (Attorney, Capital Trust Co. of Delaware.)

Orpheum Radio Stores, Manhattan, \$100,000; D. B. Beckett, H. A. Irmier. (Attorney, R. J. Rely, 41 Park Row, N. Y.)

Redoradpark Corporation of America, to manufacture phonographs, \$500,000, Wilmington, Del. (Attorney, Colonial Charter Co.)

Wright Radio Corporation, Manhattan, \$10,000; T. M. Smith, C. W. Irwin, J. A. Delany. (Attorney, G. P. Breckenridge, 7 Dey St., N. Y.)

Getting in the Home

Another interesting feature of the rise of radio as reflected in the programs broadcast, is the large number of stations which now carry regular programs designed for women at home and those interested in matters domestic as well as material of interest to small children, such as Bedtime Stories and Animal Tales. What more promising sign of the permanent arrival of radio as a feature in our national life could be found than this widespread movement of "start them in young?"

New Radio Firms! Send Radio World Your Name and Address

HOMCHARGE YOUR BATTERY for A Nickel



No mess, trouble, dirt—no moving of batteries—loss of time—no effort on your part—no technical or professional knowledge needed.

THE HOMCHARGER

successfully meets all charging conditions, and is the only rectifier combining the following essential Homcharging features:

1. Self-polarizing. Connect battery either way and it will always charge. No danger of reverse charging, ruined battery or burnt-out rectifier.
2. No delicate bulbs to break or burn out. Only one moving and two wearing parts. These are replaceable as a unit, after thousands of hours' use, at small cost. Cannot be injured by rough handling.
3. Operation stops and consumption of current ceases immediately upon disconnecting battery.
4. The only charger costing less than \$100.00 that will fully charge a battery over night. Gives battery a taper charge—exactly as recommended by battery manufacturers. Guaranteed not to harm your battery even though left connected indefinitely.
5. Highest efficiency of any three or six cell charger made.
6. No danger of fire. Approved by Underwriters. Immediate Delivery.

Attention Motorists. Will charge your auto battery as well as radio battery. Send for Bulletin No. 58 for further information. For sale by all radio, electrical and accessory dealers or shipped, express prepaid, for purchase price, \$18.50. \$20 West of Rockies.

The Automatic Electrical Devices Co.
135 WEST THIRD STREET CINCINNATI, OHIO
BRANCH OFFICES—New York, Chicago, Pittsburgh, Los Angeles, New Orleans, Detroit, Toronto, Philadelphia, Baltimore, Dallas.

NOVO "B" BATTERIES FOR RADIO

22½-45 & 105 VOLTS



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424-438 W. 33rd ST.
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531 SO. DEARBORN ST., CHICAGO.

All Live Things Produce Electricity

TO know whether an egg is alive (impregnated) or not, send a strong (electric) shock through it; if it produces an electric response it is alive, writes Professor R. S. Harris in the "Scientific Monthly." Not only has Waller used the electric response as a sign of life, he has also made it a quantitative measure of the degree of vitality. He selected a number of seeds of Phaseolus from one to five years old and tested one of each age for the production of electric current. The responses in fractions of a volt were for five years, respectively—0.0170; 0.0052; 0.0043; 0.0036 and 0.0014—a very remarkable demonstration of the statistical aspect of livingness. The older the seed the less the response; it is what one would have supposed, but it could not be taken for granted. These seeds were dry, they were to all intents and purposes dead; they were lying in a pill-box doing nothing vital, but they were not dead, they were in latent life; they could germinate and they could produce electric current.

Radio Chief Feature of County Fair

RADIO will be the principal attraction at the Steele County Fair, Owatonna, Minnesota. A radio school, even, will be established. L. F. Klima, of the board of directors of the fair, has issued the following in regard to the radio exhibit:

The directors of the Steele County Fair saw in radio a wonderful opportunity to entertain and educate the patrons of their fair.

It is fortunate that there is located here in Owatonna, a large company of broad-gauged men who are manufacturing complete radio-receiving and broadcasting sets and parts.

No county fair could afford to pay what it would cost to put on a radio show such as will be put on at this year's fair.

It was through the public spirit of these men that this great educational feature of the 1922 fair will be made possible.

The Fonce Radio company is the name of this new company who has made arrangements with the fair board to furnish all the radio apparatus for the radio building on the fair grounds.

The plans are to reduce the number of side shows, on the pike, to reduce the number of kewpie-doll stands and to devote a larger part of the fair to education.

There will be a large building or tent in the center of the grounds which will house this free radio school and show.

There will be lecturers on hand to tell anyone how to build his own radio set.

There will be a hundred or more seats with a head receiving set at each one.

The patrons of the fair can go into this building any time, sit down and rest and while resting can "listen in" to anything that is being received.

There will be a bulletin board outside so that you can see what is being received and where it is coming from.

This entire radio show and school is free to anyone. There will be no collections taken up and there will be nothing to sell.

Fifty-Six Dailies Broad- cast News

THE report of the recent meeting of the New York Associated Dailies at Kaaterskill, N. Y., that it was almost the unanimous sentiment "that radio has not as yet reached a point at which it is of advantage, and that most newspapers are going too far in devoting extensive space to it," is challenged by many.

The basis of such opinion is hard for radio experts to understand, as there are operating, to-day, fifty-six broadcasting stations owned by newspapers, three of which are in New York State.

No one can estimate the number of papers running radio departments correctly; but it is safe to say that, practically, two out of every three large dailies are doing so, and in some cities all papers carry considerable radio news, subscribing to several general and technical services.

That it pays, is obvious by a glance at the advertisements, and an appreciation of the keenness of the competition, in such cities as Detroit, Atlanta, Salt Lake, and New Orleans, where, practically, all dailies vie with each other for both news space and broadcasting excellence.

To date, none of the fifty-six broadcasting dailies has cancelled its license, and new papers are taking out licenses at the rate of about two a week.

In Washington, D. C., all five daily papers use radio news services, giving a column or more of space; and one newspaper is cooperating with a local broadcasting station.

SUBSCRIPTION BLANK

RADIO WORLD

RADIO WORLD CO.,

1493 Broadway, New York City.

Please send me RADIO WORLD for months, for which

please find enclosed \$

SUBSCRIPTION RATES:

Single Copy\$.15
Three Months1.50
Six Months3.00
One Year (52 Issues)..... 6.00
Add \$1.00 a Year for Foreign
and Canadian Postage.

HERE THEY ARE!

EBY**BINDING
POSTS**

See them at your dealers.

Corporal

Ensign "H"

H. H. EBY MFG. CO., PHILA., PA.**BUY "RITE"**

Klossner Rheostats.....	\$1.00
U. V. 220 Detectors.....	\$4.50
U. V. 221 Amplifiers.....	\$5.90
4-inch Electrode Dial.....	\$1.25
Radioite Tested Crystals—	
"Rite" Detector Unit.....	\$5.50
"Rite" Amplifier Unit.....	\$11.95
Ducons (No aerial).....	\$1.50

Postage Paid.

Wholesale and Retail.
Dealers—Write for Discounts.**Specialty Service Co.**Corner 4th Avenue and Pacific Street
BROOKLYN, N. Y.**KNOCKED-DOWN
VARIABLE CONDENSER****MONEY-SAVING PRICES**

An accurately made, fully efficient instrument that cannot get out of order or adjustment. Fully guaranteed. Extra heavy aluminum plates. Condensite end pieces. All other parts heavily nickel-plated. Knob and pointer included. Furnished assembled or knocked-down at the following low prices. Ready assembled by anyone following instructions furnished. Save money—order from us. Folder upon request.



No. of Plates	M.F.D. Capacity	Assem- bled	Knocked- down
3	.00007	\$1.75	\$1.50
11	.00025	\$2.50	\$2.00
21	.0005	\$3.25	\$2.50
43	.001	\$3.90	\$2.90

Lott's Better Radio Condenser Co.
478 ORANGE STREET NEWARK, N. J.

Radio World, 52 issues, \$6.00.

**Radio Development in
South Africa**

VARIOUS wireless-telegraph schemes are now occupying the attention of the Government of the Union of South Africa. Trade Commissioner Stevenson has informed the United States Department of Commerce, that the British Imperial Government has a scheme of connecting Great Britain and South Africa by a series of short range stations via Cairo and Nairobi, which will involve the expenditure on the part of the Union Government for its station of approximately £180,000. Under this scheme the range of the South African station is to be between 2,000 and 2,500 miles.

The possibility of utilizing radio telephony in remote parts of South Africa, and the sections otherwise difficult of access, has been engaging the attention of the post-office authorities. Two suitable Marconi sets were purchased in England, and various trials and tests made in Swaziland and other remote parts of South Africa, as well as between Cape Town and Touws River, in the Cape Province, a distant of 160 miles, by the local representative of the Marconi Company. While these trials proved very satisfactory, so far as the range and efficiency of operation under favorable atmospheric conditions were concerned, the post-office authorities express some doubt as to the commercial practicability of the method, particularly in a sparsely settled country like South Africa, where the amount of traffic between the outlying districts would not be sufficient to guarantee the cost of the installations. A source of power is also necessary, and if, as would normally be the case in an outlying district, a gasoline engine and generator would supply the necessary power, the running costs would be considerable as compared with communication by land lines.

In view of the great development of the wireless telephone in the United States, particularly by amateurs, considerable publicity has been given to the subject in South Africa. A radio society was recently formed in Cape Town.

ELECTRICAL SPECIALTIES

Auto—Electric and Magnet Wires

Dealers write for magnetic wire price lists on 1- $\frac{1}{2}$ and $\frac{3}{4}$ -lb. spools**RICHMOND ELECTRIC CO.**

181 McDougal Street Brooklyn, N. Y.

RADIO SUPPLIES—**RADIO SUPPLIES**

We carry a full line of Radio Goods
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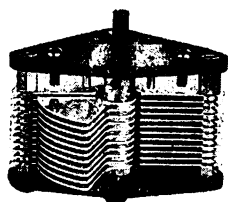
CINCINNATI, OHIO

My Wireless

WHAT brings the sunshine to my room,
Chasing far the shades of gloom
And makes the day pass all too soon—
My Wireless!
I hear the news from far-off shore
Of busy mart—the base-ball score

And list to songs I sung of yore
By Wireless!
With song and story I'm beguiled,
And go to sleep like a happy child
To dream an Angel passed and smiled
On Me and Wireless!

Radio Broadcasting News.



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23 Plate, .0005 Tested, \$1.00

FRENCH BRUNET HEADSETS

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RADIO, THE EIGHTH WONDER OF THE AGE, BECKONS TO YOU, like the telephone, telegraph, automobile, motion picture and phonograph industries did years back. Norris Radio Corporation is expanding. Together with its patents, one of which appears on page 30, the corporation is coming out with a new type of radio set which is a sensation.

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126 Liberty Street, New York

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126 Liberty Street, New York City, N. Y.

I would appreciate information on Norris Corporation plans, also copy of "Out of the Air."

Name

Address

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Occupation

The company's shares are being offered at \$15.00 per unit, consisting of one share 8% Preferred and one share of Common, \$10.00 par value on each. Rapid advance in price on the units is predicted.

Radio Trade Directory

National CARD CATALOG of
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Exclusive, Wholesale, etc.

Compiled from Information Secured from
Chambers of Commerce, Manufacturers, etc.

Circular and Sample Cards upon Request.

SYDELL'S RADIO DIRECTORY
AND SERVICE

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Coming Events

The editors of RADIO WORLD will gladly publish news items of all contemplated radio shows and expositions. Keep us posted by mailing full information.

ANNUAL SHOW OF THE ST. LOUIS RADIO ASSOCIATION, St. Louis, Mo., October 4 to 7, inclusive.

CHICAGO RADIO SHOW, Coliseum, Chicago, Ill., October 4 to 22. U. J. Hermann, managing director, 549 McCormick Building.

INTERNATIONAL RADIO EXPOSITION, Grand Central Palace, New York, December 21 to 30.

KANSAS RADIO EXPOSITION will be held at the Kansas State Fair, Hutchinson, Kansas, September 16 to 22 inclusive. A. L. Sponsler, secretary.

MERCHANTS' COOPERATIVE ADVERTISING AGENCY RADIO SHOW, Robert Treat Hotel, Newark, N. J. Date not set. Will be held this year.

"RADIO DAY," Pittsburgh, Westview Park, August 24. Under auspices of Radio Engineering Society. C. E. Urban, secretary.

RADIO CLUB OF AMERICA. First autumn meeting will be held the last Friday in September. Renville H. McCann, secretary, Columbia University, New York.

CLEVELAND RADIO AND ELECTRICAL EXPOSITION, Cleveland Public Auditorium, Cleveland, O., August 26 to September 4, inclusive.

INTERNATIONAL RADIO CONGRESS (Radio Pageant of Progress), Municipal Pier, Chicago, September 17 to 20. John E. Dolan, director.

A Weather Man Explains "Static"

(From an Interview with Eric R. Miller, Meteorologist, United States Weather Bureau, Madison, Wisconsin.)

THE average man is unaware that there is such a thing as atmospheric electricity, except when it thunders. The work of the radio operator is interfered with continually by sounds of snapping, crackling and grinding in his head-phones. These signal the arrival of stray waves from more or less distant thunderstorms.

The generation of electricity in thunderstorms has been explained by G. C. Simpson of the Weather Bureau of India. He found by experiment that when drops of water fall through a vertical blast of air that the breaking of the drops into spray is accompanied by the production of positive and negative electricity, and that the drops are left with a positive charge.

A strong upward current of air is one of the most conspicuous features of the thunderstorm. It is always evident in the turbulent cauliflower-shaped heads of the cumulus cloud from which thunderstorms grow. Besides, strong upward currents are necessary for the formation of hail, which so often accompanies thunderstorms, since the freezing raindrops and growing hail must be carried repeatedly to the cold that is found only at high altitudes. In the turmoil of a thunderstorm raindrops may be forced through the cycle of union, division, of coalescence and disruption many times, with the formation at each disruption of a correspondingly increased electrical charge.

Hence, one started, the electricity of a thunderstorm grows to a considerable maximum. If this theory is correct, and it seems well founded, it must follow that the one essential to the formation of the giant cumulus cloud, namely, the rapid uprush of moist air, is also the one essential to the generation of the electricity of thunderstorms. This is the reason that lightning seldom occurs except in connection with a cumulous cloud. It is simply because the electrifying process of splashing is vigorously active in this cloud and nearly absent in all others.

The use of a coil antenna will enable any radio receiving outfit to locate approaching thunderstorms and to forecast their time of arrival quite accurately when within twenty or thirty miles. The coil antenna gives the strongest effect for waves approaching in the plane of the coil, least along the axis of the coil. The vertical coil must be arranged to turn through a semi-circular horizontal arc. In experiments at Hampton Roads, Virginia, the average wave length on which the best results were obtained was 900 meters. The average intensity of static or thunderstorm days exceeded the average static on no thunderstorm days by 36 per cent, but the difference was much greater as the storm approached.

**An
Important Radio Subject
Treated by an Expert
Using Radio Frequency to
Extend Range**

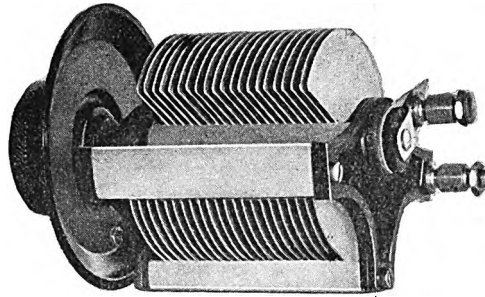
By GEORGE W. MAY, R. E.

In the Next Issue of

RADIO WORLD

Saturday, August 5, 1922

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3-inch Dial and Knob for 1/4 shaft with recessed White Enameled Degrees on black ground75c

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A metal spring under dial for ground wire to cut out body static from condenser. A 3-inch Dial and Knob with recessed white enameled degrees on black ground. Also a diagram label to place on board, showing where to drill holes for spindle and screws, insuring perfect registration with condenser, without measuring or marring the board.

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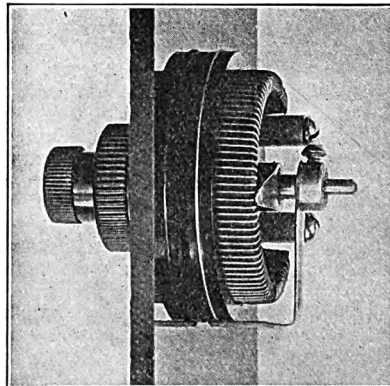
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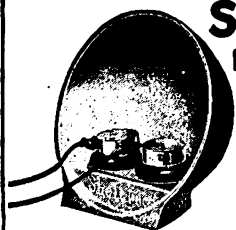
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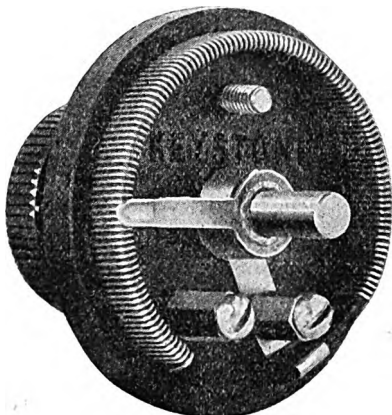
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CARRYING CAP., 1½ AMPS.
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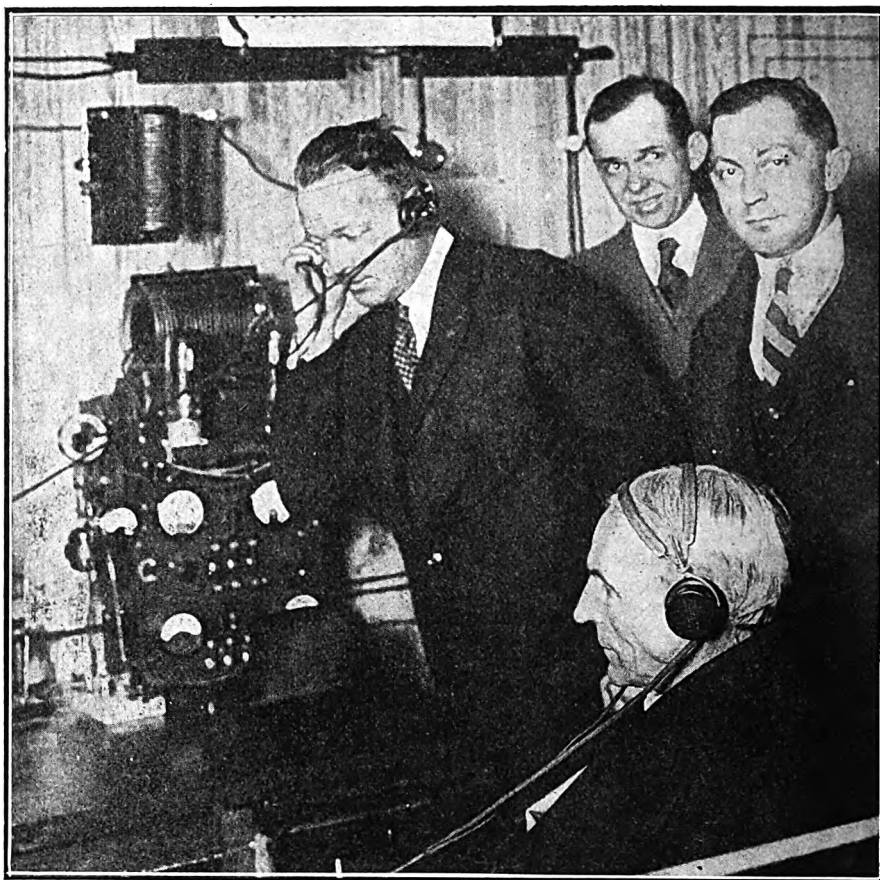
Wire or Write for Discounts.

Immediate Delivery

Manufactured by

Keystone Radio Company

Dept. W. GREENVILLE, PENN.

Henry Ford Says it's "Fine"

(C. Underwood & Underwood.)

Henry Ford—here he is in the right-hand lower corner with head-phones on—has become one of the most ardent radio fans. He seldom misses a chance to listen in. "Fine!" he said after he had heard some information he was seeking come to him from the ether.

**75,000 to 100,000 New York
City Apartments Equipped
With Radio**

ALMOST every apartment house on the East Side (New York) as well as the West Side has one or several radio antennae stretching from a chimney to a water tank, or from pole to pole erected at the ends of the roof, while many just drop an insulated wire out of the window, keeping it free from the brick or stone surface of the building, says *The Times*, New York.

While the many wires seem to tell the story of radio installation in the majority of apartments in Manhattan, they only serve as the introduction to a most interesting tale of the advance of radio.

The great difficulty radio has experienced in entering the New York apartments has been in finding a way to satisfy the landlords who objected to the erection of wires on the roofs of the buildings.

Thus necessity to please the apartment owners has brought into use several indoor antenna systems in the form of loop antennae, and in many cases merely a single wire extended around the room or down the hallway, even concealed behind the molding. Another new and popular indoor antenna system is the use of a little plug which, when placed in the electric light socket, permits the use of the house lighting system as a means of absorbing the radio waves.

The improvements which have been made in radio amplification during the past few years, and the use of the indoor antenna, have made possible the pleasure of enjoying radio concerts in city apartments equal to the entertainment radio has afforded in the homes where the landlord "had nothing to say."

Radio has grown so rapidly during the past year that it is impossible to determine the exact number of apartments in New York City equipped with radio receiving sets; however, a fair estimate for the present day would be 75,000 to 100,000.

Plans being made for apartment houses to be built within the next few years provide radio equipment for each apartment. There will be a central receiving station connected with the apartment and in charge of an experienced radio operator, quite similar to the switchboard operators in the apartment hotels.

Radio Will Help Music

THE radio broadcasting station can be the biggest asset that the music publishers can have if they will learn to take best advantage of it. They should send copies of new songs to the broadcasting stations, gratis, with the request that they be turned over to a good musician to be played for the benefit of the radiophone audiences. If the music strikes the popular fancy, the radio "listeners in" will be first to purchase it. Anything that makes a hit with the radio audience is a long way on the road to success. As a matter of fact, members of the Music Chamber of Commerce should consider it a great opportunity to have their wares brought to the attention of the public in this effective manner. When they get this service for nothing they do not appreciate it. If they had to pay for it, they would all clamor for it.—*The Evening Mail Radio Review*.

Fifty-two issues for \$6.00. Sub. Department, Radio World, 1493 Broadway, N. Y. C.

New System for Learning Code

THERE has been developed a novel system for memorizing the various combinations of dots and dashes which make up code. It is the product of a Scotch radio engineer by the name of F. MacBeth, who spent considerable time while in the Orient working it out in detail. It is based upon the well known lines of memory words, or mnemonics says "The Tribune," New York.

The novelty of the system lies in the fact that he has worked out six letters as the basic combination of all the others, and when combining them to form the other letters, they actually make a word which is easy to remember.

The letters B and D will amply illustrate this system. For instance, the letters N, E and I are three of the basic combinations. In making B he takes the letters N and I, which together equal the dots and dashes of B. The memory word in this case is nib. Similarly in the case of the letter D. The two combinations in this case are N and E. For the purposes of memorizing, N and E are combined with D and form the memory word ned. This system is followed throughout.

This novel system undoubtedly offers a short path for the novice to tread in memorizing the dots and dashes of the code for each letter. It does not give him the necessary speed to read what the wireless telegraph stations are saying. That comes along with constant practice.

About Receivers

WHAT seems to confuse the radio enthusiast is the kind of receiver he should buy. To-day there are two types of sets on the market commonly known as the crystal set and the set that employs the vacuum tube. Both of these receivers will respond to spark and telephone signals, but with the better class of receivers made to-day, tuning is so sharp that the undesired spark stations may be eliminated. The present market has quite a number of crystal receivers, which are simple to adjust. These sets will bring in the music only for short distance, as this receiver is of the non-regenerative type. The tube, or regenerative-type receiver, is one which employs the vacuum tube and tends to bring in the signals much louder having the advantage of employing one or two stages of amplification with the marked advantage of employing a loud speaker.

How the Current Flows

THE current which flows through a telephone receiver is a direct, pulsating current, corresponding to the group pulsations of audio-frequency. It isn't, in actuality, strictly direct current, but a uni-directional current of a pulsating character. The vacuum tube, as a rectifier, does not rectify absolutely 100 per cent, and consequently there is an alternating current flow in the plate circuit back to the grid circuit, and the bridging condenser assists the flow of this current, which aids in amplifying.

To many anxious inquirers. **RADIO WORLD** has no free list. One copy is sent as a voucher to each advertiser or advertising agent represented in current issues. All other copies are paid for on subscription or through the news trade.

Helps for You

Technical Articles That Appeared in Radio World Since Its First Issue

- APRIL 1.**
A 500-Mile Radiophone Employing a 5-Watt Tube, by Frank A. Hahnel.
"Tell Me, Please, How Will This Set Receive?" by E. L. Bragdon.
Short Cuts in Receiver-Circuit Design, by O. C. Roos.
Making a Short-Wave Regenerator, by Fred. Chas. Ehler.
- APRIL 8.**
Do You Know Your Receiving Equipment, by James D. Gordon.
Why a Crystal Is Called a Rectifier, by Walter Emmett.
Is Radiotelephony Dependable? by O. C. Roos.
Mounting Crystals in Your Detector, by E. L. Bragdon.
Storage Batteries for Radio, by Fred. Chas. Ehler.
- APRIL 15.**
First Principles of Electricity as Applied to Radio, by John P. Miles.
Your Storage Battery, by E. L. Bragdon.
What Makes Radio Possible, by Edward Linwood.
Ground Connection as Vital as Antenna, by Fred. Chas. Ehler.
- APRIL 22.**
Solving the Puzzle of the Honeycomb, by Fred. Chas. Ehler.
More About Your Storage Battery, by E. L. Bragdon.
Vacuum Tubes as Applied to Receivers, by Walter J. Howell.
How to Build the Loose Coupler and the Variometer, by Frederick J. Rumford.
The Best Aerial for a Receiving Station, by Edward Linwood.
- APRIL 29.**
Valuable Pointers on Aerial Construction, by Edward Linwood.
What Is Meant by Tuning, by E. L. Bragdon.
Radio-Frequency Amplification and Regeneration, by Frank Armstrong.
Honey-Comb Coils and Condensers, by Edward Linwood.
Charging the Storage Battery, by E. L. Bragdon.
How to Construct the Variocoupler, by Frederick J. Rumford.
- MAY 6.**
The Advantages of Radio Frequency, by Harold S. Potter.
How to Construct, Protect and Operate a Storage Battery, by George W. May.
The Beginner's Catechism, by Edward Linwood.
Tuning and What Is Meant by It, by Fred. Chas. Ehler.
New Frequency Amplifier Brings Faintest Waves in Strong, by G. W. May.
- MAY 13.**
My Practical V. T. Detector and Two Stage Amplifier, by Frederick J. Rumford.
The Principles of Radiotelegraphy, by Walter J. Howell.
The Reason for the Loop Aerial, by George W. May.
Tuning and What Is Meant by It, by E. L. Bragdon.
The Beginner's Catechism, by Edward Linwood.
- MAY 20.**
The Design of an Amateur Receiving Set, by C. White.
The B Battery and the Plate Current, by George W. May.
Radio Terms at a Glance, by Fred. Chas. Ehler.
The Beginner's Catechism, by Edward Linwood.
Fire Undewriters' Rules, by Fred. Chas. Ehler.
- MAY 27.**
The Beginner's Catechism, by Edward Linwood.
How to Make Your Own Condenser, by George W. May.
Tuning as Applied to Telegraphy, by Walter J. Howell.
Why the Condenser Doesn't Condense, by E. L. Bragdon.
Making Signals Louder with Two-Stage Amplifier, by George W. May.
- JUNE 3.**
The Cost of a Single-Circuit Receiver, by Howell S. Miller.
The Beginner's Catechism, by Edward Linwood.
How to Compute and Build a Fixed Condenser, by E. L. Bragdon.
Design for an Amateur's Receiving Set, by C. White.
Simple Method of Recharging a Storage Battery, by John Grayson.
- JUNE 10.**
Radio Receiver for Short Waves, by George W. May.
How to Filter Atmospheric Conditions, by C. White.
- The Messenger Boys of Broadcasting, by E. L. Bragdon.
Are You a Member of the N. O. D. C.? by E. L. Bragdon.
The Beginner's Catechism, by Edward Linwood.
How to Construct One- and Two-Slide Tuning Coils, by George W. May.
- JUNE 17.**
The Vacuum Bulb's Start in Life, by C. White.
How to Select the Right Set, by E. L. Bragdon.
The Beginner's Catechism, by Edward Linwood.
Test of Inductance Coils, by Fred. Chas. Ehler.
Short Waves from a Simple Receiver, by Stanley Bryant.
- JUNE 24.**
How to Make Your Radio Cabinets, by W. S. Standford.
How the Crystal Detector Is Used to the Best Advantage, by C. J. Williams.
How to Construct a Long-Wave Regenerative Receiver, by George W. May.
Tested Invention of Major Armstrong Amplifies Set 100,000 Times, by John Kent.
Repairing Cracks in Hard-Rubber Storage Battery Jars, by W. S. Standford.
The Beginner's Catechism, by Edward Linwood.
- JULY 1.**
Novel Unit-Detector and Amplifier, by Frederick J. Rumford.
Why You Must Use a Condenser, by C. J. Williams.
How Wave Lengths Travel, by Fred. Chas. Ehler.
Radio World's Revised Dictionary, by Fred. Chas. Ehler.
The Beginner's Catechism, by Edward Linwood.
Use of the Vacuum Tube Detector, by George W. May.
- JULY 8.**
Radio's Place in the Phenomena of Nature, by E. L. Bragdon.
The Function of the Loose Coupler, by Charles H. Plath.
Armstrong's Superregenerative Amplifier Fully Explained, by John Kent.
Operating a Transatlantic Station, by Fred. Chas. Ehler.
The Beginner's Catechism, by Edward Linwood.
Reducing Strays and Statics, by Fred. Chas. Ehler.
- JULY 15.**
Assembling a Detector and Two-Stage Amplifier, by H. S. Standford.
Combined Radio and Audio Frequency Amplification, by C. White.
The Beginner's Catechism, by Edward Linwood.
Locating Your Aerial, by Harold Day.
Facts for Beginners, by Fred. Chas. Ehler.
- JULY 22.**
When Your "Movies" Come by Radio, by Stanley Bryant.
Underlying Principles of the Vacuum Tube, by George W. May.
Practical V-T Detector Panel, by Frederick J. Rumford.
Revised Radio Dictionary, by Fred. Chas. Ehler.
The Beginner's Catechism, by Edward Linwood.
Importance of Aerials to Radiation, by C. White.
- Any single copy of **Radio World**, beginning with No. 1, mailed on receipt of 15 cents postpaid. Any seven issues for \$1.00. The full 17 numbers sent for \$2.50. Or send \$3.00 for 3 months (26 numbers) or \$6.00 for 1 year (52 numbers) and have your subscription start from No. 1. **Radio World**, 1493 Broadway, New York City, N. Y.

Don't Worry About Static

STATIC makes radio reception prohibitive only during thunderstorms; at certain other times it may be almost imperceptible if the receiving set be of the proper type for hot weather reception and capably manipulated. Dealers find that some of the public still look askance at radio as an attractor of lightning; this fallacy has been so thoroughly exploded that any fears predicated on it are more a matter of superstition than of reason.

RADIO WORLD'S QUICK-ACTION CLASSIFIED ADS

This department is intended for everybody who wants quick action on short announcements covering the buying, selling, exchanging or general merchandising in the radio field. Readers of RADIO WORLD will find that it pays to read these columns every week. Advertisers will get a ten-day service here—that is, copy received for this department will appear in RADIO WORLD on the news-stands ten days after copy reaching us.

The rate for this RADIO WORLD QUICK-ACTION CLASSIFIED AD. DEPT. is 5c. per word (minimum of 10 words, including address), 10% discount for 4 consecutive insertions, 15% for 13 consecutive insertions (3 months). Changes will be made in standing classified ads., if copy is received at this office before 4 P. M. on any second Tuesday preceding date of publication. RADIO WORLD CO., 1493 Broadway, N. Y. C. (Phone, Bryant 4796.)

PATENTS—Electrical cases a specialty. Pre-war charges. B. P. Fishburne, Registered Patent Lawyer, 386 McGill Bldg., Washington, D. C.

Manufacturers of Rogers Radio Receivers and Rogers Receiving Radiometers. Rogers Radio Company, 5133 Woodworth Street, Pittsburgh, Pa.

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RADIO MANUAL—Everything the beginner should know. How to build and operate an inexpensive receiving set. Sixty-four pages, thirty illustrations. Twenty cents. Post paid. **RAYDIO PUBLISHING COMPANY**, CAXTON BUILDING, CLEVELAND, OHIO.

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SALESMEN—To call on Radio Dealers. Splendid opportunity. Liberal commission. Write **EDW. J. GOETZ CO.**, Distributors, Cambridge Bldg., Cincinnati, Ohio.

THAT ARMSTRONG AMPLIFIER Illustrations and reading matter about the much-discussed amplifier devised by Major Edwin H. Armstrong appeared in three issues of RADIO WORLD—June 24, July 8, 15 and 22. These copies will be sent on receipt of 15 cents each, or the 4 copies for 60 cents. Or, better still, subscribe and have your subscription start with RADIO WORLD of June 24 and get all these issues. RADIO WORLD, 1493 Broadway, New York City.

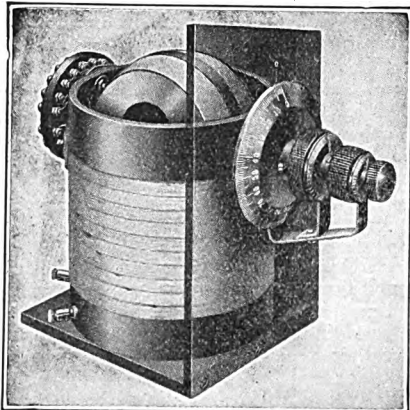
FIRST 17 NUMBERS OF RADIO WORLD from April 1 to date will be mailed, postpaid, on receipt of \$2.50. Or send us \$3.00 for 6 months (26 numbers) or \$6.00 for year (52 numbers), and we will start subscription with first issue. RADIO WORLD, 1493 Broadway, New York City.

He wrote a friend in a nearby city, who had a radio receiving-set installed in his office, and astounded his native town, as well as his rival editor, by printing the last-minute news, even before the big-city papers came to town. Finally, his method was discovered. He had his friend buy the late papers in the big city, read the important last-minute news into his radio sending apparatus, which broadcast the items so that the editor, with his radio receiving-set could hear the radiophone messages and write copy simultaneously!

Radio Flash Outspeeds Editorial Pen

IN a small town in the Middle West, there are two weekly newspapers, both of which publish on Friday. There is considerable rivalry between them, and the editors are continually at penpoints with each other. Recently, one of the papers ran a "lead" stating that its news was more newsy than its opponents. Immediately, the second editor began working on a plan to outdo his rival, and hit upon the following!

An Epoch-Making Advance in Vario-Couplers



Selector Vario Coupler—3 units in one. Pat. Pending. Cat. No. 970
Show your customers this new development. It is an instrument of great accuracy and is the product of an organization whose engineers have had long experience in Radio Research.

The New Norris "Selector"

Every dealer should sell this new Norris "Selector" Vario-Coupler because it is an instrument each "Fan" will want. It combines in one compact unit, an efficient and accurately designed vario-coupler and the necessary tuning switches. It is actually three instruments in one as separate controls are provided for both the coupling and each of the two primary switches.

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PATENTS

Protect your invention today. Write for 1922 Illustrated Book Free. Radio, Electrical, Chemical and Mechanical experts. Over 30 years' experience. A. M. Wilson, Inc., 310-18 Victor Building, Washington, D. C. (Successors to business established 1891 by A. M. Wilson.)

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BARGAINS IN USED APPARATUS—Acme Amplifier Unit, new, \$10.00. Two Slider type couplers, \$4.75 each. Saco Clad amplifying transformer, \$3.85. Remler control panel, \$7.00. Large navy type coupler, \$9.00. Audion control panel for tubular detector, \$9.00, cost \$30.00. Lee Brothers Company, Champaign, Ill.

VACUUM TUBE DETECTOR SETS. Completely assembled and wired without tube, phones or batteries, \$15.00. Guaranteed. Demonstrated. R. Lukates, 910 East 216th St., New York City.

REGENERATIVE SET less tubes, batteries, phones. Consists 2 variometers, variocoupler, variable condenser, rheostat. Sell \$30.00. Ibelli, 312 Adams St., Brooklyn.

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SEND 60 cents for four issues of RADIO WORLD containing articles and illustrations about Major Armstrong's remarkable amplifier. Or subscribe, and subscription will be started with first number containing Armstrong material.

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A New Radio Feat

AT a prize fight, held in Madison Square Garden, New York, recently, there were several men at work in the cellar of the main floor, during the fight. These men were very anxious to learn the outcome of the fistic battle. One of the men bethought himself of a friend, who, he knew, had a radio receiving-set, and he remembered that the fight was being broadcast from Newark.

So he telephoned his friend, who rigged up his set with a loud-speaking set near the mouthpiece of a telephone connected to the cellar of the Garden. The workmen, at the receiver of the telephone in the cellar, were able to learn the details of the fight above, within a few feet of the telephone. The complete circuit was as follows: the fight returns were sent from the Garden to Newark by land phone, broadcasted by radio from Newark, and returned to the cellar of the Garden by phone again!

Radio Set Complete

Enjoy Daily Concerts, Weather Crop and Sporting News

Complete Outfit \$12.75
Including 2,000-ohm Phones
Immediate Shipment.

Can be installed in 30 minutes by any one.

Full instructions with each set. Send check or money order to

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DL-25... \$1.54 each	DL-300... \$1.93 each
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43 Plate.....	\$4.75 each
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 Metal Dials 3/4" diam. 1/4" shaft.....90c.
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Dealers will find it worth their while to write for attractive discounts on these articles and others we carry in stock

Viking Radio Company

26 Cortlandt St. New York City
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All But Two States Now Broadcast

THE States of Kentucky and Mississippi went on the Department of Commerce's Broadcasting Map, last week, when stations in Louisville and Corinth were licensed. There are but two States, Delaware and Wyoming, left without broadcasting stations, every other State of the Union having one or more.

Eleven limited commercial stations licensed during week ending July 15, bring the total broadcasters to 406. Of the new stations, Nevada, District of Columbia, California, New Jersey, Georgia, Illinois, Kansas, Montana, and Wisconsin, besides Mississippi and Kentucky, opened one station each. The new stations are as follows:

WHAO—F. A. Hill, Savannah, Ga.
 WHAP—Dewey L. Otto, Decatur, Ill.
 WHAN—Southwestern Radio Co., Wichita, Kansas.
 KFBB—F. A. Buttery & Co., Havre, Mont.
 WHAS—Courier Journal and Louisville Times, Louisville, Ky.
 WIAA—Waupaca Civic & Commerce Assn., Waupaca, Wis.
 WHAQ—Semmes Motor Co., Washington, D. C.

3000 OHM SETS, \$4.50

2000 OHM SETS, \$4.00
 1000 OHM SETS, \$3.50
 Plus 20c for Postage and Insurance
 Satisfaction Guaranteed or Money Back.



We will mail phones the day your order arrives. Every pair tested, matched, and guaranteed as sensitive as \$8 to \$18 phones. We have no agents or dealers. By ordering direct you save dealer's profits—circular free.

TOWER MFG. CO.
 11 STATION ST., BROOKLINE, MASS.

KFBD—Clarence V. Welch, Hanford, California.
 WHAR—Paramount Radio & Elec. Co., Atlantic City, N. J.
 KFAS—Reno Motor Supply Co., Reno, Nevada.
 WHAU—Corinth Radio Supply Co., Corinth, Miss.
 The call of the Galveston Tribune, assigned last week, is WIAC.

Wants to Buy Radio Sets Outright

Winston-Salem, N. C.
 July 15, 1922.

Radio World,
 1493 Broadway,
 New York, N. Y.

We are very anxious to buy outright the best and most complete radio sets that can be used for advertising purposes. We know little about the game and will appreciate it very much if you will give us all the suggestions possible. Our plan is to buy these machines outright for which we are going to pay spot cash, re-sell same or put them out on a retail basis.

GENE FOCHT.

Old Bill Shakespeare seems to have been somewhat of a radio bug himself, for he hooked up "The Tempest" to an Ariel.—Roy K. Moulton, in "The Evening Mail," New York.

RADIO STORES CORP.



If your dealer cannot supply you, send us his name and \$9.00. We will ship you an "ALL-WAVE" Coupler by return mail, post paid.

\$9.00 List
 INCLUDING 6 HOOK-UPS

WE ARE DISTRIBUTORS FOR

The "ALL-WAVE" COUPLER

150 TO 3,000 METERS

Guaranteed Wave Length

A combination vario-coupler, and loading coil. Incorporates a superior process of combination flat and bank winding on one compact unit. Permits building the most compact receiver at a low price, as it eliminates Variometers, Vario - Couplers and Loading Coils.

222
 West
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Variable Condensers

Compact, Interchangeable, Highly Finished,
 All Sizes, 3 Plate, \$2.00; 43 Plate, \$4.00.
 Templet for Mounting

Standard Wireless Corp.

HEMPSTEAD, N. Y.

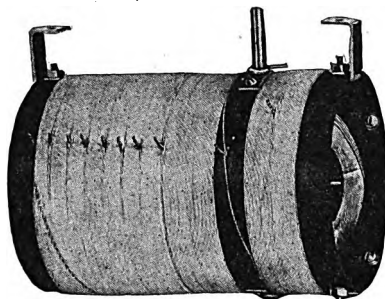
Manufacturers of Tools, Dies, Precision Instruments

LIST PRICE

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Guaranteed
 Wave Length

150 to 3000 Meters



Patent Pending

Six efficient Hook-ups sent upon receipt of 10c. stamps or FREE with each ALL WAVE COUPLER.

The New

"ALL WAVE"

COMBINATION FLAT AND BANK WOUND

Coupler

Entirely Eliminates
 the use of

All Variometers,
 Variocouplers and
 Loading Coils

Permits the building of the most compact and efficient receiver at a considerably lower cost.

We guarantee the "ALL WAVE" Coupler (with a money back guarantee) to give maximum results for long or short wave long distance selective reception.

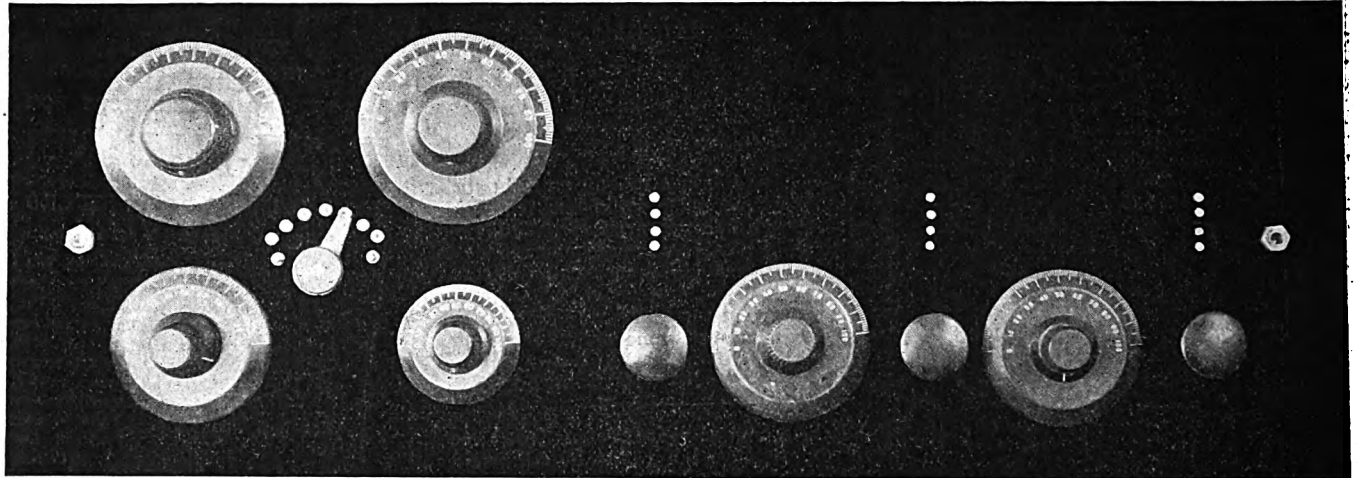
If your dealer cannot supply you, send us his name and your order; we will supply you direct or through him.

Manufactured by

Capitol Phonolier Corporation

54 to 60 Lafayette Street
 NEW YORK, N. Y.

THE NEW ARMSTRONG



Front view of the second set constructed. This receiver employs three tubes and gives very high amplification.

SUPER-REGENERATIVE RECEIVER

HOW TO CONSTRUCT AND OPERATE IT

*The Only Authentic Booklet with
12 Photos and Diagrams of Two Different
Sets Constructed by the Author*

By Kenneth Harkness

Booklet Ready for Delivery at Your Dealer or Direct.

PRICE 50c.

Published by

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256 WEST THIRTY-FOURTH STREET
NEW YORK CITY

**DEALERS—QUANTITIES OF ALL ESSENTIALS
READY FOR DISTRIBUTION**

RADIO WORLD

Entered as second-class matter, March 28, 1922, at the post office at New York City, New York, under the act of March 3, 1879.

I L L U S T R A T E D

Two Happy Hearts Are United by Radio!



(C. International Newsreel Photo.)

At the left, Miss Mable Brady, the bride; at the right, John H. Stone, the groom. They were married by radio at different stations in Dallas, Texas. The minister who performed the ceremony was at a third station. The marriage vows were spoken by the minister and repeated by the marital pair by radio.

HOMCHARGE YOUR BATTERY for A Nickel



No muss, trouble, dirt—no moving of batteries—loss of time—no effort on your part—no technical or professional knowledge needed.

THE HOMCHARGER successfully meets all charging conditions, and is the only rectifier combining the following essential Homecharging features:

1. Self-polarizing. Connect battery either way and it will always charge. No danger of reverse charging, ruined battery or burnt-out rectifier.
2. No delicate bulbs to break or burn out. Only one moving and two wearing parts. These are replaceable as a unit, after thousands of hours' use, at small cost. Cannot be injured by rough handling.
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4. The only charger costing less than \$100.00 that will fully charge a battery over night. Gives battery a taper charge—exactly as recommended by battery manufacturers. Guaranteed not to harm your battery, even though left connected indefinitely.
5. Highest efficiency of any three or six cell charger made.
6. No danger of fire. Approved by the Underwriters.

IMMEDIATE DELIVERY.

ATTENTION MOTORISTS
Will charge your auto battery as well as radio battery.
Send for Bulletin No. 58 for further information.
For sale by all radio, electrical and accessory dealers or shipped, express prepaid, for purchase price \$18.50
\$20 West of the Rockies

**THE AUTOMATIC ELECTRICAL
DEVICES CO.**
135 West Third St. CINCINNATI, OHIO
BRANCH OFFICES—New York, Chicago, Pittsburgh,
Los Angeles, New Orleans, Detroit, Toronto, Philadelphia, Baltimore, Dallas.

Just a Few of the Marvels of Broadcasting

THE inside of a broadcasting station of the larger sort is highly interesting. It might aptly be termed a Wizard's Magic Box. The audion-tube, to be sure, is somewhat more complicated than the wand of the fairy story, but, at the same time, a thing relatively simple, being no more than a glass bulb from which the air has been pumped, in which a little wire and a small sheet of thin metal handle infinite numbers of electrons at the bidding of the Wizard, who controls this wand of an audion-tube merely by the manipulation of an electric switch.

The building which houses the WJZ broadcasting station at Newark is only a very ordinary, red-brick factory structure. It is in that part of Newark known as the Lackawanna Depot section, and the only tell-tale thing about it is the large aerial which surmounts it and which can be seen from pretty nearly any quarter of Newark.

When there is no static worth speaking of, this aerial sometimes reaches as far as California to the West, and half way across the Atlantic to the East. It has been "caught" away back in the northern part of the great Canadian forest, and as well looking to the South, in the lower reaches of the Caribbean Sea and Central America.

Passing through a commonplace factory entrance, one finds the watchful eye of an attendant peering at you through a tiny window at the end of a vestibule. If you are among the elect, he informs you that a Mr. Popenoe, who presides over the Wizard's Box, will soon see you. Then you are escorted into a diminutive waiting room. Finally you find yourself in a large chamber. The one end is a luxurious parlor, with upholstered chairs and sofas, while the other part boasts only a grand piano, a Victrola and the microphone. Dropping from the ceiling to the depth of three feet, and encircling the top of the room, is a heavy drapery, which serves as an acoustic curtain. Without this the tones of the piano would be sharp and rasping, and the voice of the singer would blurr and be followed by an uncouth echo.

The one microphone, used by the announcer and speakers, is suspended in the middle of the apartment, while the other, attached to the end of a large and old-fashioned phonograph horn, hangs in a corner. The latter is designed primarily for transmitting concerts.

The microphone is somewhat similar to a telephone transmitter, but only so far as the delicate diaphragm is concerned. This, in the case of the microphone, is a very thin disk of metal. It is one unit of a system consisting of a single turn of wire wound around the inductance of the antenna circuit, with the microphone connected in series with the voltage induced in the turn of wire and single loop of wire.

As the sound waves, produced by the singer, speaker or orchestra, strike this delicate microphone disk, it is set vibrating. Immediately the high current of electricity, which is passing through it, flashes along to the oscillators and modulators, which are vacuum tubes, and thence to the audion bulbs. Here the magic of it all is performed; the sound waves are transformed into ether waves and sent hurtling through space to be picked up here, there and everywhere by the listening radio fans.

INDUCTANCE SWITCH



Switch, Complete, 50c. Without
Contact Points and Stops, 35c.

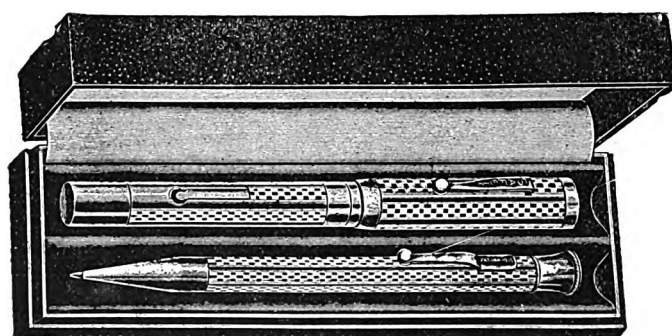
6 Ohms, 1 1/2 Amp. FILAMENT RHEOSTAT



List Price, \$1.00

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Gentlemen: Without any obligation on my part, please send me particulars of the above offer.

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Special Offer TO Radio World READERS

RUSH your name and address and we will tell you HOW you can get this handsome 14k. Gold Filled Fountain Pen and Pencil Set.

Absolutely Free

REMEMBER, with our plan it WON'T cost you a cent. The set comes to you in an elaborate plush box. Fill out the coupon herewith and mail at once for our FREE PLAN.

Latest broadcasting map 15c. That is, a complete broadcasting map appeared in Radio World, No. 8, dated May 20. Mailed on receipt of 15c. Radio World Company, 1493 Broadway, N. Y. C.

If you did not get copies of Radio World No. 1 to No. 16 send us \$2.20 or we will send you this paper for one year, (\$6.00 for 52 issues) and start it with our first issue, which will be mailed you as soon as possible after receipt of order.

RADIO WORLD

[Copyright, 1922, by Radio World Co., New York, N. Y.]

A Weekly Journal, Published Every Wednesday and Dated Saturday, By Radio World Company, from Publication Office, 1493 Broadway, New York, N. Y. Telephone: Bryant 4796

Vol. 1, No. 19

August 5, 1922

15c. per copy, \$6.00 a year

Tuning in on a Fifth Avenue Bus



(C. Central News Photo Service)

With a small aerial erected on the roof of the bus, the receiving set—as shown photographed inside—picked up concert music in fine style as the bus was being driven along Riverside Drive. Just another proof of what may be expected of radio

United States Navy Will Take Radio to Brazil

IN the fall, when the U. S. S. "Nevada" and, perhaps, another of our modern battleships, steam southward to Brazil with a delegation of representative American officials, she will also carry the navy's first contribution in the way of modern radio-equipment to an international exposition.

Packed carefully in her hold the "Nevada" will transport several very interesting pieces of radio apparatus, one of which will bring cheers from all radio fans. It is a five-by-six-foot model of New York harbor, with all the lighthouses, lightships, radio stations and compass stations located, named and illuminated—with miniature ships which will pass in and out of Ambrose Channel guided by an electric magnet, unseen beneath the glass top,

which passes over a safe route through the channel. The magnetic attachment is to illustrate the operation of the radio-piloting cable running into the harbor to Fort Wadsworth from two hundred yards south of the Ambrose Channel Light Vessel.

When operating, the model will show a vessel approaching New York in a thick fog, the shore stations and even the light ship and buoys not being visible. The tiny ship hesitates and can well be imagined asking the radio-compass stations at Amagansett and Fire Island on Long Island, or Sandy Hook and Mantoloking, for her position. The lights on the shore stations blink fitfully, indicating the transmission of the bearings, and, directed by them, she proceeds to the Ambrose Channel Light Vessel where her sound-detect-

ing devices on either side of her hull pick up the submarine radio signal "NAVY" emitted constantly from the pilot cable. From there on it is almost simple in reality as it appears during the operation of the model actuated by the electrical magnet under the glass. The ship steams slowly but deliberately up the channel to quarantine, and, in the case of the model, returns to the Atlantic so the vessel may repeat the performance for new observers.

Other naval exhibits will include a set of radio-compass equipment in operation, the head phones being available for the visitor so that he can hear the incoming calls and locate the station calling by compass direction. A 2-kw. arc transmitting set such as is used by vessels of the shipping board and the navy, will also be in operation.

TTEFA

How to Construct and Operate the Armstrong Superregenerative Circuit

By John Kent

AN epoch-making invention, which will completely revolutionize broadcasting was described by RADIO WORLD in its issues No. 13, dated June 24, and No. 15, dated July 8. So important is this system that a survey of the results already obtained by the writer leaves one astounded. Its possibilities are almost unbelievable. This invention is the work of Major Edwin H. Armstrong, one of the leading radio experimenters of the United States. It is known as a superregenerative set.

What confuses many amateurs as well as experts in regard to it is the different hook-ups published in various newspapers and other periodicals. So many queries have been received by RADIO WORLD asking for explicit directions concerning the circuit, that I will endeavor to explain fully and simply the complete circuits of Major Armstrong's invention. There are two circuits which are authentic and officially correct.

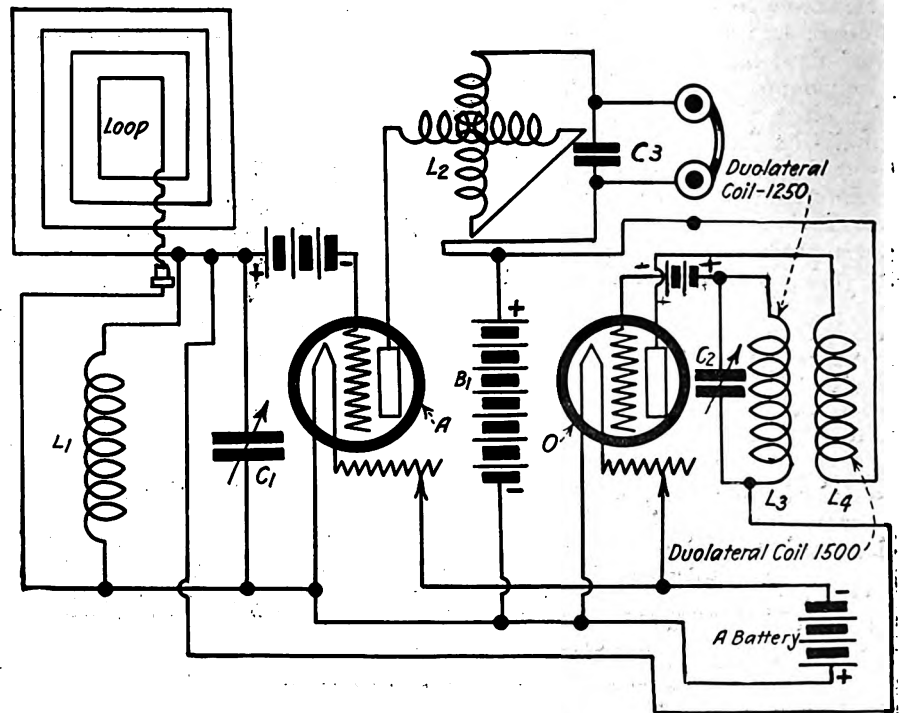
It may be said that, in one move, the new system opens up the unexplored territory in wave lengths below 100 meters and sweeps from broadcasting all need for outdoor aerials or other wires, making it possible to reproduce music to the same degree of loudness—regardless of whatever amount of steel there may be in the framework of the building—as a talking machine. It further cleans the slate by eliminat-

ing that hoodoo of broadcasting—interference—caused by spark signals from wireless sets, and destroys over 50 per cent of troublesome static.

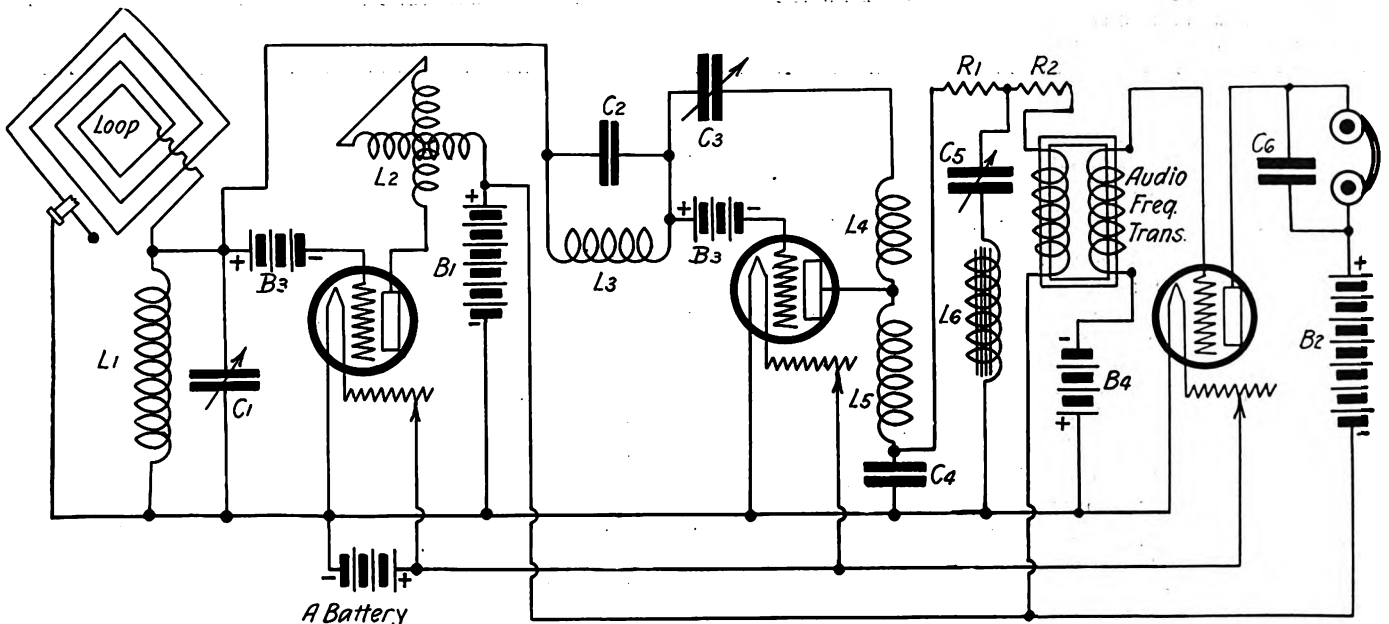
Figure 1 shows the basic principle

of Major Armstrong's circuit. Figure 2 shows the same circuit, but with the addition of one stage of amplification. This difference is what confused everyone. Either circuit may be used, but each circuit should be studied before one attempts to experiment with either.

Figure 2 is the same as Figure 1,

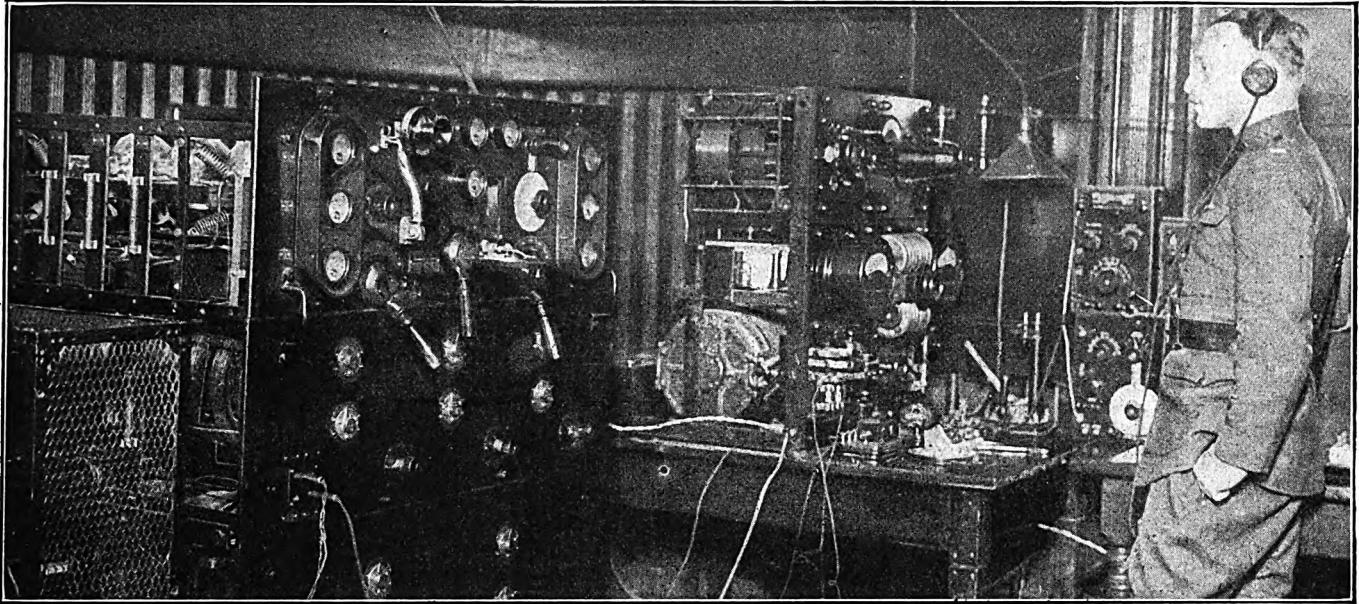


Schematic diagram showing Major Edwin H. Armstrong's revolutionary circuit. This is the basic principle of his idea in which he employs only two tubes. One tube is used as an amplifier, the other as an oscillator. Suggested by John Kent. Drawn by S. Newman & Co.



Complete schematic diagram showing the same circuit as in the smaller diagram except that three tubes are employed. The third, or last tube, is used as a stage of amplification in which the signals are amplified over 100,000 times. Suggested by John Kent. Drawn by S. Newman & Co.

Gotham's Busy Broadcasting Station



(C. Keystone View Co., N. Y.)

The interior of the broadcasting station at Bedloe's Island, New York. Lieutenant H. S. Paddock, U. S. A., who is shown in the photograph, is in charge. This is one of the best-equipped broadcasters in the United States. It is operated by the United States Army. It is familiar to many hundreds of radio fans by its call letters—WVP. It operates on a wave length of 1,450 meters—one that is particularly free and clear and permits of very little "jamming." The photograph gives a splendid idea of the important radio details of an up-to-date station. At the extreme left of the photograph is the large transmitter, which sends music and the human voice over the ether. WVP has been picked up on all parts of the Western Continent and far out on the Atlantic. Note particularly the mouthpiece on the panel with its many switches and meters, which indicate the various wave lengths and the degree to which the matter being transmitted may be modulated. This station has every possible modern radio device. It is the only station in America where the phonotron—commonly known as a "soup plate"—is used in transmitting. This device is used exclusively by the United States Government. Not only does the phonotron record, but it picks up every small particle of energy in the transmitting room and sends it into the room shown in this photograph to be broadcast. On the table at the right of the photograph is a half-kilowatt transmitter, in which capacity it is used by the operator for relaying messages when operating on a wave length of 200 or 240 meters. This transmitter, being of the damped-wave type, can be heard at most any amateur station within a range of some hundred miles. This is done to keep in touch with the so-called amateur reserve of the United States Army. Code practice, as well as straight-letter language, are sent, enabling the amateur to become familiar with the different methods in which signals may be received.

(Continued from preceding page)

with the exception that it contains one stage of amplification. The loop aerial consists of 12 turns of No. 18 bell-wire, the turns being spaced about $\frac{1}{4}$ of an inch apart and wound on a 3-foot frame, spiral type.

L1 represents the primary of the variocoupler used in the primary circuit.

L2 represents the secondary of the coupler, here shown as a variometer. If secondary of coupler is used, omit the variometer; but if variometer is used, then the primary coupler is all that will be needed. The primary of the coupler should have a range of from 150 to 600 meters, while the secondary, or tickler coil, should have the number of turns rewound twice.

L3 is a duolateral coil having 1250 turns of wire on it.

L4 is an open core-choke of about 5 or 10 millihenries inductance.

L5 is another duolateral coil of 1500 turns.

L6 is an iron core-choke coil of 100 millihenries of inductance.

C1 is a variable condenser of .001 mfd., capacity.

C2 is a fixed condenser of .00025 mfd., capacity.

C3 is a variable condenser, .001 mfd., capacity.

C4 is a fixed condenser, .005 mfd., capacity.

C5 is a variable condenser of .001 mfd., capacity.

The first tube in the circuit is made to act as a regenerator, with the second tube as the oscillator. The third tube is an audio-frequency amplifier and connected in the regular way. The last tube may be left out if desired; but in that case it will be difficult for experimenters to tune the set, which will be very critical in adjustment. This is not recommended, but if the experimenter wishes to try it out then he will have to apply Figure 1 circuit to the set. R1 and R2 are Lavite resistances 12,000 ohms fixed value

These resistances help to make up part of the filter system which filters out the high pitched note caused by high 20,000-cycle frequency which the oscillator tube oscillates. In constructing the three-tube set, hard tubes—that is amplifier tubes—should be used through-

out the circuit. In actual demonstrations, Western Electric tubes, type L, were used by Major Armstrong. Radiotrons UV-201 are very serviceable for the set. So is any other tube with a high vacuum which will withstand high voltages without ionizing.

An audio-frequency transformer of the ordinary type or design is used. A battery is the filament battery and may be used by merely connecting the filament and rheostats in parallel such as in any ordinary amplifier. The use of individual batteries is recommended. B1 is a battery of 90 volts, B2 is about 110 volts, while B3 is a biasing battery of from 1 to 5 volts. Two flashlight batteries on series will answer for this battery. B4 is a battery of 22 volts. The only coils that must be placed in inductive relation with each other are the coils of the variocoupler. If this hook-up is wired correctly, there should be no body effects.

While the superregenerative receiver does everything that is claimed for it, it is now in a stage of development.

When Radio-Controlled Warships Go to War without Men

By Carl H. Butman

WASHINGTON, D. C.—The days of Naval heroes are numbered; no more will there be a call for volunteers to sink a ship in a narrow channel with the hope of "bottling up" a fleet, as did Hobson at Santiago Harbor. The call of the future will be for radio operators. Dynamite-laden colliers will not be run into harbor mouths, under fire, and sunk by gallant crews, nor will such marine maneuvers as the Allied attack on Heligoland be undertaken by manned ships of war. These hazardous and almost hopeless tasks will be left to radio-controlled vessels, if all that is expected of radio comes true.

A year ago, the battleship "Iowa," a relic of the Spanish War, but controlled and maneuvered by modern radio from the Ohio over five miles away, was bombed by an aerial fleet of planes, which registered some hits. Nearly every one was excited about the progressive conquest of the sea by the air forces, especially when aerial bombs demonstrated that German war-craft could actually be sunk; but no one was particularly elated over the performance of the gigantic Iowa, the real marvel of that historical occasion. For the first time in history, practical demonstration of remote control by radio was seen. John Hays Hammond, Jr., invented and perfected the radio control of a small craft before the war but most witnesses foresaw only a new mechanical, or electrical, toy. His invention applied to a seagoing battleship should have indicated astounding future developments to the witnesses of the "Iowa's" remarkable performance off the capes in Maryland and Virginia, last June and July, but it didn't.

Without a soul aboard, this great hulk of a fighting ship was maneuvered by radio, for hours and for miles, at half speed, at full speed—which was only eight knots, but could have easily been increased with more boilers in operation. She plowed the sea, turning to port or starboard at the will, not of the man at the helm, but the radio officer aboard the "Ohio," several miles astern. And this man could have operated as well a hundred miles astern.

To-day, expert electrical engineers and Naval officers say the old "Iowa" is the first of a fleet of radio-controlled ships of war; crewless ships which will go into battle against an enemy

fleet or enter an alien harbor in response to an invisible master-mind, miles away, guiding them by means of radio signals. These ships, like the "Iowa," would not be operated by power sent by radio, but would be self-propelled ships with standard engines, oil-burning boilers with mechanically aimed and fired guns—all directed by radio. Farsighted Naval engineers have prophesied radio-controlled barrages of air and water torpedoes, fleet movements, gunfire, mine explosion, airplanes, tanks, dynamite ships and mine sweepers—unmanned, but operated by radio and sent on errands of destruction.

To the skeptics who exclaim, "Impossible!" they ask, "Why not?" and point to the successful operations of the "Iowa," the radio-controlled automobile of E. D. Glavin, and the tank of Captain Vaughan, which not only was maneuvered at will but made to fire a pistol and do all manner of tricks within a fraction of a second.

The Bureau of Engineering of the Navy is not standing still; some of the more advanced problems have been solved already, others are under way, and even the conservative experts admit that, within five years, we may have an auxiliary fleet of unmanned war vessels controlled by radio.

Naval engineers will not reveal the technical details of her "innards" but explain the operation of the "Iowa," generally, as follows:

A crew of men, after starting the oil burners and the engines, abandon ship. The control ship takes charge. A signal from her aerials is picked up by the antenna on the radio ship and transmitted below. There it is amplified and made to operate a very sensitive relay which manipulates a larger relay. The main relay controls an electric circuit which governs a pneumatic valve. This opens and closes the throttle of the main engines mechanically by compressed air, at the will of the radio operator. The main relay also manipulates a sort of commutator which is the key to a standard steam steering system controlled by electrical motors. Maneuvering is

also effected automatically in this radio ship by means of a gyrocompass, likewise connected to the master commutator, enabling the operator to "set the wheel," so to speak, on a given course.

All sorts of devices are installed for carrying out the details of operation, such as controlling water and fuel-oil feeds; but the "mechanical brain" of this radio monster is the commutator which literally interprets the radio signals and executes "orders," all within a second. A time-clock device is provided to keep the craft from running away should the control-ship's radio apparatus cease to function properly. If radio signals are not received after a certain lapse of time, the clock takes charge of the crewless ship and shuts down everything. All the apparatus, except Mr. Hammond's special relays for the conversion of the radio signals into currents sufficiently strong to operate devices, was developed by radio engineers of the Bureau of Engineering of the General Electric Company. The scheme is entirely American and is a carefully guarded secret.

The first radio-controlled battleship is not through by any means; she is still in special commission at the Hampton Roads Operating Base, where she is in charge of a trained crew of mechanics and electricians, awaiting the fall maneuvers of the Atlantic Fleet, when she will again become a target ship, this time for gunfire practice. But she will not be destroyed. Her future is assured, for she is far too valuable to be sunk with all her special equipment, while there remains so many experiments yet to be tried before her successors are developed. However, she will serve as the first radio-controlled moving target for the fall practice of the fleet—an event postponed from the summer maneuvers at Guantanamo Bay, Cuba, due to lack of funds and fuel. Special shells are being cast for the several types of naval guns which will be aimed at her this fall; shells which will not be armor piercing or explosive, but which, nevertheless, will indicate hits. They may carry away a smokestack or a pilot house—damage of little consequence to this craft, the progress of which would be undisturbed unless her vital aerials were shot away.

The "Iowa" bears watching, and the next few years will tell whether naval prophets are right about the practicability of radio-controlled fleets.

I wouldn't give radio five minutes of my very valuable time if I didn't fully believe in its importance to the world.—Lee de Forest.

Using Radio Frequency to Extend Range

By George W. May, R. E.

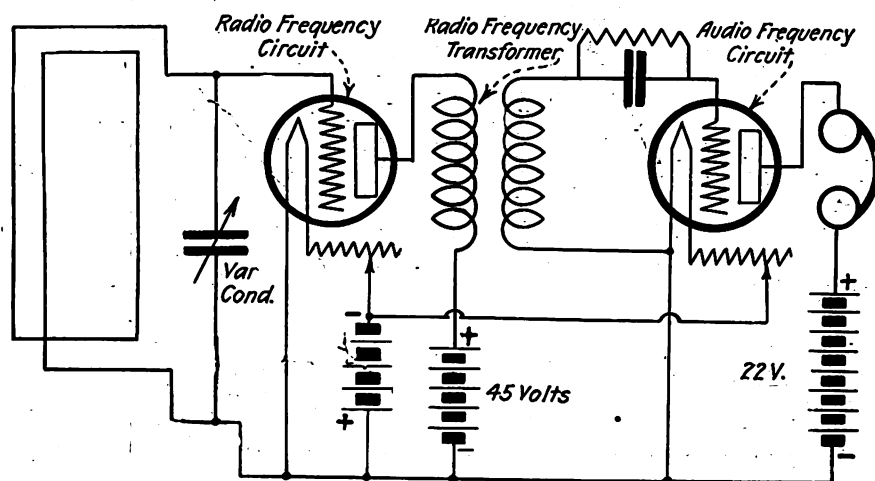


Figure 1—Schematic diagram of a single step of radio-frequency amplification, utilizing a radio-frequency transformer which sends it through the ordinary detector for rectification.

ARE you satisfied with the receiving range of your set; that is, provided you use but one vacuum-tube? Many amateurs would like to hear more distinct stations. If so, an amplifier would fill the bill.

An amplifier, briefly, is a device for reproducing and magnifying a radio signal or speech wave. It is a practical reinforcement-medium for weak signals, making possible the reception of signals otherwise inaudible. It is utilized for the energization of the loud-speaking telephone, the trans-continental phone and distant control. Amplifiers are classified on the basis of operating frequencies, their type of coupling, and number of stages of amplification. At present there are two types of frequency-amplification and three groups of amplifiers, namely: types AUDIO- and RADIO-FREQUENCY. The groups are divided

as follows; *Audio-frequency amplifier (AF), Radio-frequency (R.F), and the universal amplifier.*

The three methods of coupling are *Resistance-coupled amplifiers, Transformer coupled and Reactance-coupled amplifiers.* Any type could be utilized but it is merely a matter of choice. The number of stages in use to-day are the *two-stage amplifier, the three-stage, and the six-stage amplifier.* Sometimes an amateur makes up a combination of audio- and radio-frequency, as in the six-stage receiver, then we would have two stages of radio frequency, detector, and, then, three stages of audio frequency.

Audio-frequency amplifiers are placed after the detector tube. Then they amplify the rectified oscillations, or audio-frequency currents. Audio frequency should be used where loudness of signals is desired, while radio-

frequency amplifiers should be used where distance or range is wanted. A combination of both radio and audio frequency will make a receiver capable of long distance and loud signals. In cases where the receiving station is near the transmitting station, the energy received in the phones is usually sufficient to reproduce sound without the aid of amplification. When the receiving station is more distant, the signal, or speech, must be built up, or amplified, before it passes through the detector and the stages of audio frequency.

If radio frequency is *not* used, audio-frequency amplification is of little use. The radio-frequency method of amplification increases the strength of the incoming antenna currents through successive stages until it becomes of sufficient intensity to enable detection to take place. With the addition of one or two stages of audio-frequency amplification, a current of sufficient strength will be generated to actuate either in the telephone or the loud speaker.

The circuit connections of a two-stage amplifier are shown in Figure 1. This, it may be observed, has one stage of radio frequency, detector, and one stage of audio frequency. Between the first two tubes is the radio-frequency transformer used by myself in various circuits and described by me in RADIO WORLD at different times. The radio-frequency transformer I have used is some well-known make with which I have accomplished some wonderful results. The first tube used in this circuit is a UV-201 amplifying tube, precaution being taken that it is an amplifying tube and not a detector tube. The second tube is the detector tube, UV-200, which rectifies the amplified radio-frequency current by means of the grid condenser and leak. The pulses of the rectified current, or audio frequency in the plate circuit, are amplified by the audio-frequency transformer sent through the input terminals of the audio-frequency transformer. The third and last tube is a

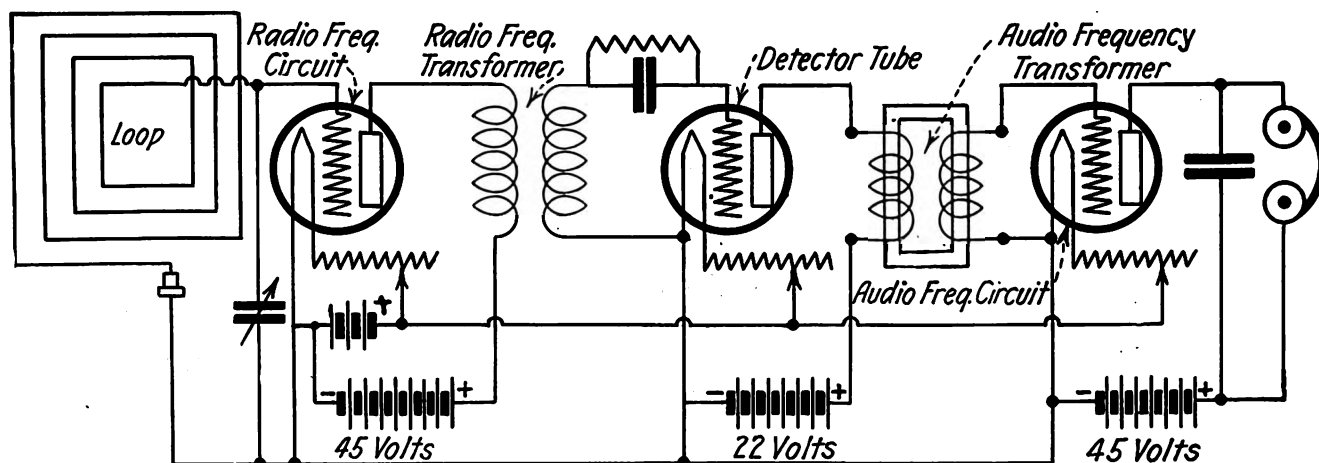


Figure 2—Circuit connections of a two-stage amplifier. This circuit has one stage of radio-frequency, detector and one stage of audio-frequency. Suggested by G. W. May. Drawn by S. Newman & Co.

Radio News from Europe

A SYSTEM of wireless telephony now connects the Turks Islands and the Caicos Islands in the West Indies, the same installations being used also for wireless telegraphy and for communication with ships. The distance covered by the radiotelephone circuit is about 12 miles.

Recent advices received at the Department of Commerce, Washington, D. C., from Trade Commissioner Young, at Riga, Russia, state that, during May, a new wireless telephone broadcasting station, located on the Kursk Railway station in Moscow, was opened by the People's Commissariat of Post and Telegraphs. The station was built by the Nizhni-Novgorod laboratory of the Government, and is designed to broadcast messages and wireless press sent out by the government.

The wireless traffic between England and Spain, which has been handled for some time by land wires to the Poldhu station and thence by radio, has been greatly improved by the substitution of the new Marconi station at Ongar as the transmitting agency. This station is worked by distant control from London, so that messages filed in that city are sent direct by radio without any retransmission. The same station is now working on schedule with three other continental wireless stations.

Poldhu, located in Cornwall, is one of the oldest and probably the best known of the European high-power radio stations. At the present time it is not being actively used and its eventual disposition is uncertain, although there has been some discussion of a plan to convert it into a radiotelephone broadcasting station.

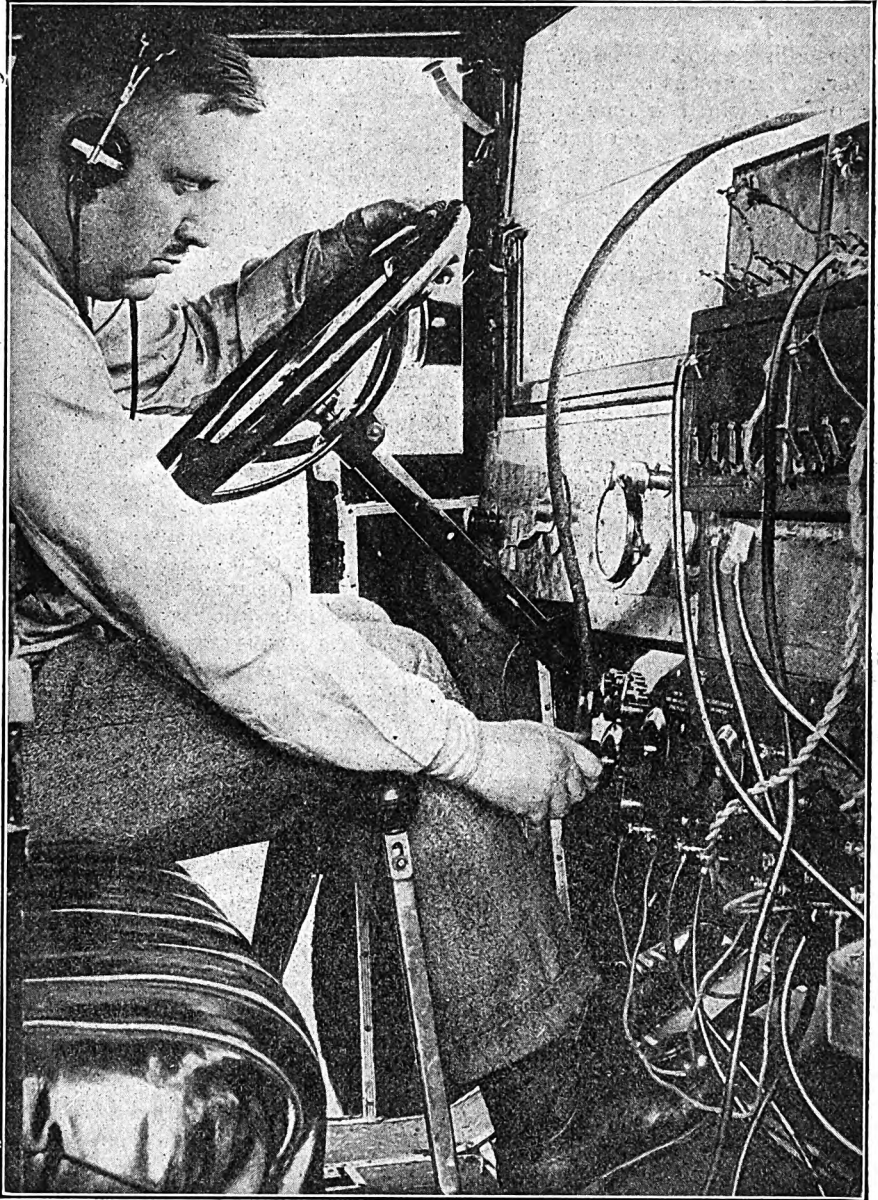
The Egyptian Department of State Railways, Telegraph and Telephones has announced that commercial wireless service is open to the public from the station at Abou Zabal, according to a report received at the Department of Commerce from Consul Maynard, Alexandria. Since 1914, when the station was completed, it has been used only for government messages, but will now handle commercial traffic through the State offices. Wireless messages to Great Britain and Ireland will be accepted subject to the same rules as ordinary telegrams.

(Continued from preceding page)

UV-201, another amplifying tube which receives the charge from the secondary winding of the audio-frequency transformer. Entering this tube, it is amplified many times before it is sent through the telephones.

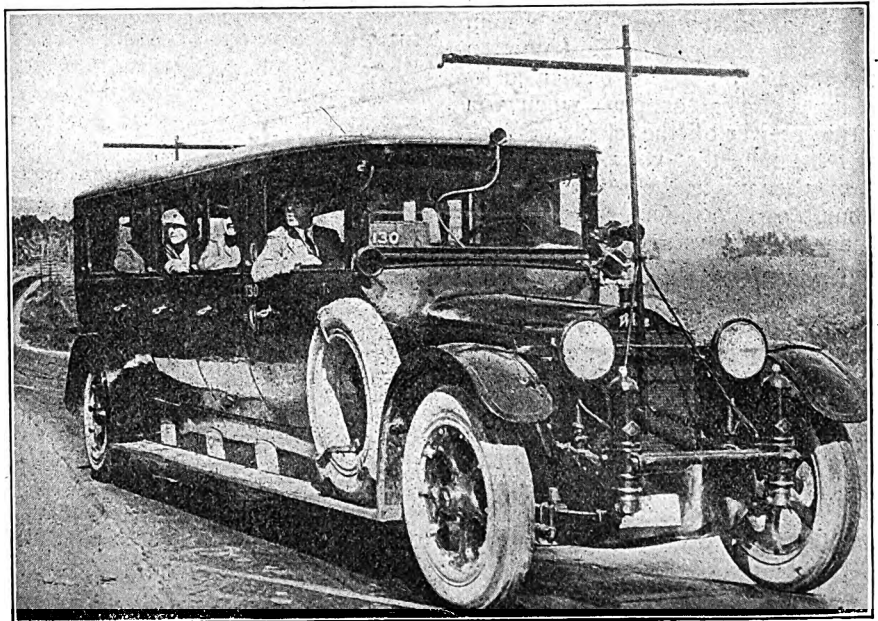
If the radioist wishes to add a few more steps of radio frequency, or audio frequency, he may easily do so. Figure 2 shows a sketch of a single step of radio-frequency amplification, utilizing a radio-frequency transformer, then sending it through the ordinary detector for rectification. The transformer is connected between the plate of the amplifying tube and the detector, or second tube. The aerial used with both these circuits is of the loop type. Signals were received wonderfully—better than by using all audio-frequency transformers in circuit.

Radio Music for Bus Patrons



Radio concerts for the patrons of a California bus line are the very latest development in the radio field. With only a two-step radio-receiving outfit and handicapped by a low antenna, the reception proved successful.

(Both photographs copyrighted by Kadel & Herbert News Service)



Things Every Radio Fan Must Know

THERE are two chief methods of installing a double-circuit receiver. The first is by the use of a loose coupler, which is now more or less discarded, and the other is by means of the variocoupler.

The loose coupler consists of a primary inductance, which is a wire wound about an insulated tube in such a way that we have a certain number of turns on the tube. The more turns of wire there are on the tube, the longer is the wave length to which it will respond.

The secondary of a loose coupler consists of a winding on another tube, which is so arranged that it will slide in and out of the primary tube. In fact, it will come completely out of the tube, and may be pulled quite a few inches clear of the primary tube. In this manner we have three possible adjustments. First, the number of turns on the primary that we can bring into play in the primary circuit; second, the number of turns that we are bringing into the secondary circuit, and finally the inductive relationship between the two coils themselves, which is known as "close" or "loose" coupling.

The object of this loose coupling is to eliminate the effect of interference by loosening the coupling between the two coils. It has been found in practice that when the primary and secondary circuits are in resonance with each other the two coils can be separated quite a distance and signals still be recorded in the telephone receivers, whereas signals that are not in resonance with the circuits will be eliminated by widening the coupling between the two coils.

The tickler is the coil of wire that is placed in an inductive relationship to the primary and secondary circuits of the receiving set. The tickler itself is in the plate circuit of the vacuum tube and affords a feed-back system that gives regeneration. The function of the tickler coil is best explained by pointing out what happens when you take the receiver off the telephone hook during the time that your bell is ringing and then place the receiver up to the mouth of the telephone transmitter.

The receiver is recording the ringing of the bell; it transfers this to the transmitter and the transmitter takes the sound, transfers it into electrical energy and passes it along the line again into the receiver, which in turn again puts it on the transmitter.

This operation is continued, each time louder, until a certain maximum is reached, which results in a terrific howl that can be heard all over the room. This is regeneration, and in a radio circuit the tickler coil does just exactly the same thing.

There is nothing mysterious about

By E. E. Hawley

the rheostat. Many amateurs seem to shy at the sound of the word. It consists of special metal-wire wound in spiral form around a suitable frame. This metal has a certain definite quality by which it offers a definite degree of resistance to the passage of an electric current. The more of this wire there is in the circuit the more resistance will be offered to the flow of current—and that is the reason the resistance is made variable, so that one may control the current flowing through the filaments of the vacuum tube.

This degree of control can be further increased by the addition of a vernier rheostat. This is a smaller rheostat, of about one ohm resistance, placed in series with the other larger rheostat. The vernier should be so constructed that it has smaller turns in order that closer adjustment can be made.

In connection with the filament circuit of the receiver, it will be observed that some sets have a potentiometer across the storage battery.

It is not an easy matter to wind a bank-wound coil. For such a coil, having a wave-length range up to 2,600 meters, it will be necessary to take a tube $3\frac{1}{2}$ inches in diameter and $4\frac{1}{2}$ inches long, winding it with No. 24 S.

Detecting Amplifiers

WE have often heard the terms "Hard" and "Soft" used in reference to vacuum tubes. This means that there is what is known as high vacuum and low vacuum in a bulb or tube. Hard bulbs will not ionize at very high voltages. Soft bulbs will ionize at low voltages. The soft bulbs act as detectors, while hard bulbs are preferable for amplifiers and oscillators. The output of soft bulbs is limited so far as oscillations are concerned. Soft bulbs as a rule will give better response as oscillation detectors than hard tubes. The experimenter will have to make a few trial tests in order to obtain good signals with soft tubes. If a tube, when being brought to brilliancy, becomes blue in color, this proves that it is a soft tube or detector; but if no signs of the blue glow are seen then it is an amplifier and should be used as such.

To many anxious inquirers **RADIO WORLD** has no free list. One copy is sent as a voucher to each advertiser or advertising agent represented in current issues. All other copies are paid for on subscription or through the news trade. —Advt.

S. C., wire in three banks. One must take at least eight taps from this coil. It will be necessary to have a special winding device, consisting of two end-pieces for the tube, with a shaft and a handle. Practice only can make perfect this type of winding. First of all, wind three complete turns around the tube, keeping the wire as tight as possible.

At the end of the third turn bring the wire up between the second and the third turns and wind once around. Then another turn between the first and the second. At the end of the fifth turn, jump up between the fourth and fifth and wind one turn. The result should be a pyramid of three turns, then two turns, then one. When the sixth turn has been completed, bring the wire down to the tube and put on the seventh turn, the eighth on the seventh and the ninth on the eighth. Turn to the tube again and repeat the process.

To take off taps when the tapping point is reached, bend the wire sharply to one side and wind a single turn around the part of the coil already wound. Bring the end of that turn back to where it was started and continue the winding. After the coil has been completed and varnished cut the tapping turns and take off the taps. This method keeps the winding tight and the taps out of the way. The object of winding a coil in this way is to eliminate or reduce to a minimum the capacity effect between the windings of the coil itself.

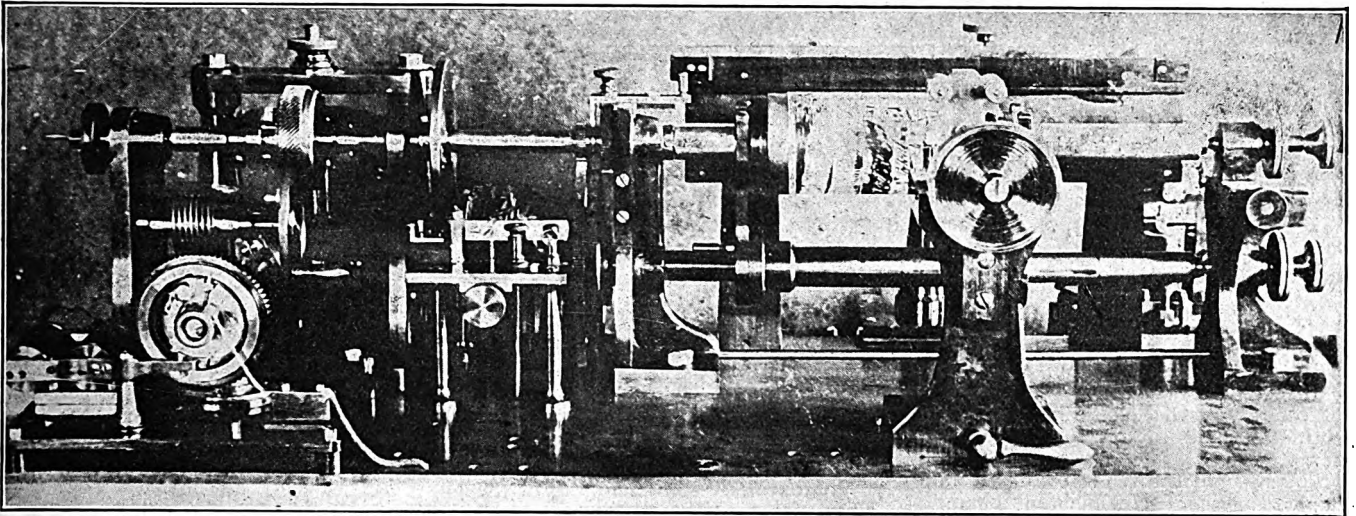
The Vernier adjustment has reference to the small variable-condenser placed in parallel with the condenser across the secondary of an oscillating circuit. There are cases in which it would refer to the small Vernier variometer used in variometer circuits.

This adjustment is placed there in order to get very minute tuning for continuous wave-reception. This system of wireless transmission is very sharp and only by the most careful adjustment can it be properly recorded on a receiving apparatus. As radiotelephony is conducted by means of continuous waves, the Vernier adjustment is a very important element. The best point to have this Vernier adjustment is in the midway position, between the two hissing points of your set.

If you vary the Vernier adjustment carefully you will find that your set will begin to hiss low down on the scale and then ascend to the highest pitch, until it reaches a point where the hissing ceases. That is the point at which the adjustment should be. If you carry the adjustment further you will find that the hissing starts again from a high pitch and then descends down the scale.

Photos by Radio! New Belin Device

By A. N. Mirzaoff



(C. Central News Photo Service.)

First photograph published in America of the perfected invention of Edouard Belin, of France, for transmitting photographs both by wire and radio.

THE brilliant French inventor, Edouard Belin, who has been engaged in the problem of transmitting pictures by electricity for over fifteen years, announces several improvements in his apparatus. His first success was recorded when he reproduced a message sent from Paris to Antwerp, April 14, 1920. In October, 1921, messages were successfully transmitted in the same manner between France and the United States.

M. Belin's apparatus consists of a copper cylinder, not unlike one used in the early Edison phonographs. This cylinder is made to revolve while, at the same time, a microphone diaphragm (somewhat resembling the sound box of a phonograph and a recording stylus) pass slowly along it in a lengthwise direction. The picture is placed face downward on the copper cylinder after the latter has been covered with shellac. The cylinder is then placed in hot water so that the paper may be removed while the gelatine film of the print is left on the cylinder.

It is true that some of the gelatine is also dissolved, but this solution is proportional to the lights and shadows of the picture. Because of this, the picture forms a bas-relief on the cylinder with the darker portions higher than the lighter ones, since the darker parts are more resistant to the action of the water. The cylinder is then placed in the machine and the apparatus set in motion. The stylus of the microphone presses against the surface of the picture, covering every part of it point by point, thus causing the

microphone diaphragm to vibrate to a greater or less extent according to the height of any given portion of the bas-relief.

Since this diaphragm is exactly like the transmitter of a telephone, except that it is moved by the stylus instead of by sound waves, it sends impulses of electricity over the wire to the receiving end. The path made by the stylus over the revolving cylinder is spiral in form. At the end of the wire is the receiving apparatus. This comprises a cylinder which moves at exactly the same rate of speed as that of the sending apparatus; but instead of the metal needle which formed the transmitting stylus, or "translator" as it is commonly called, the stylus here, whose function it is to impress the sensitive film upon the cylinder is a fine thread of light.

The electrical impulses which are sent over the wire from the gelatine film in the manner just described, set in motion an extremely sensitive galvanometer, in which there is a delicate quartz thread bearing a very small mirror. This mirror is twisted slightly in one direction or the other in precise accordance with the movements imparted by the stylus to the microphone at the transmitting end. At one side of the mirror is a lamp

whose rays are focussed upon it. This pencil of light shifts its position in accordance with the twisting of the mirror; but a lens catches it and always bends it back to the same focussing point. Another special feature of the apparatus is a screen placed between the lens and the mirror. This screen varies in color, being transparent at one end, but gradually shading to a very dark tone at the opposite end. Since the pencil of light must pass through this screen, the amount of light focussed on the revolving cylinder at any given point is in this way made to vary exactly in accordance with the vibrations of the diaphragm of the sending apparatus.

When the pencil of light finally reaches the sensitive film spread upon the revolving cylinder, it impresses the latter, making a delicate photographic line upon it, whose degree of lightness or darkness varies to correspond with the motion of the mirror. Since the cylinder is not only revolving, but moving forward at the same time, this shaded line of light forms a continuous spiral about the cylinder so that it gradually reproduces upon the latter the lights and shadows of the original picture. Since the film at the receiving end has, of course, never been previously exposed, it must be protected from outside light, and for this purpose a special frame, or hood, is employed, provided with a very small aperture through which the printing pencil of light passes. To prevent any distortion of the picture, the sending and receiving cylinders must revolve synchronously.

We will be talking by radio, dancing by radio, doing business by radio—perhaps dining by radio—in another few years—who knows?—Prof. Jacques Le Porte, of France.

The Radio Primer

The beginner who follows regularly this department in **RADIO WORLD** will secure a liberal education in the applied principles of radio science

Radio World's Revised Radio Dictionary

By Fred. Chas. Ehlert

Molecule.—The smallest group of atoms of an element, or compound, which exist by themselves.

Motor (Electric).—A device for converting electric energy into mechanical energy.

Motor - generator.—Two machines coupled together. Mechanically changing one form of electricity to another.

Mutual induction.—The production of an electric pressure in one circuit to another circuit in close proximity.

Natural Frequency.—The natural wave length of an aerial without the introduction of other elements.

Non-Synchronous.—When two or more things are not in a similar condition or position at the same time.

Ohm.—The unit of resistance. A circuit is said to have one-ohm resistance when a pressure of one volt is required to send a current of one ampere through it.

Ohm's Law.—The law of electricity. It states that the pressure of volts in a circuit is equal to the amperes flowing through a circuit divided by the resistance in ohms.

Oscillations.—Electrical oscillations are alternating currents of high frequency. Usually ten thousand to a million per second.

Oscillatory Circuit.—One which allows the free flow of electric oscillations.

Oscillation Transformer.—One or two coils of wire arranged so that one of them transfers the energy from one to the other, or from the closed to the open circuit.

Phosphor Bronze.—An alloy of copper and tin. It has great strength and is used for aerials in radio work.

Pliotron.—An amplifier with three elements, used for high-power transmission. Usually contains a very high vacuum.

Polarization.—The changing of the polarity of a cell.

Rheostat.—A resistance coil usually provided with a means of varying the amount of resistance it is considered necessary to use.

Potentiometer.—To enable fine variations of voltage to be obtained by means of a sliding contact which plays over a fixed resistance through which a constant current flows and which has a certain definite resistance. A clear picture of the potentiometer can be made by considering two circuits, an input and an output, going to and coming from the resistance. The input, which may be any source of E.M.F., goes to the ends of the resistance, and the output is taken from one end and the sliding contact. The reason for this operation, and the mathematics of the potentiometer are very easily understood. Ohm's law tells us that $E=IR$ (Voltage=Current x Resistance) and, since the input circuit is through the whole resistance, I is constant. But the portion of the resistance between the variable contact and the end from which the output circuit is taken is variable, and hence, since I is constant, in order to maintain the equality of the equation $E=IR$, if R changes, E must change in the same direction by a proportional amount.

is not necessary as these tubes are steady in their operation.

* * *

Which is preferable, a loose coupler or a two-slide tuning coil for use with a vacuum tube?

As a matter of fact, a loose coupler is better than a two-slide tuning coil, because the loose coupler employs two coils of the inductive type while the two-slide tuning coil has only one coil of the conductive type. Better selective tuning is observed by the inductive couplers, as a large percentage of interference can be eliminated.

* * *

Is a grid leak and condenser necessary when using a tube set?

It is most essential that a grid leak and condenser be used. The grid leak and condenser should be placed in the grid circuit of the detector tube only.

* * *

In using a potentiometer across the A battery, what does it actuate in the circuit?

The potentiometer is placed across the A battery to give better control of the circuit. It helps to eliminate local noises caused by the batteries. Whenever this potentiometer is used in the circuit, the negative lead of the B battery is connected to the sliding contact or the variable portion of the potentiometer. By varying the potentiometer the best contact point may be secured for loud signals.

* * *

What is the function of the grid leak in a circuit?

When placed around the grid condenser, it allows the negative charges stored up in the grid condenser to leak off after the passage of a train of oscillations.

* * *

How may the crystal be tested for good contact without depending upon the reception of outside signals?

By employing the buzzer circuit.

* * *

What does the buzzer circuit consist of?

The buzzer circuit consists of a battery, buzzer, and a push-button switch, all in series. From one terminal of the buzzer a coil of 12 turns of No. 16 wire is wound around the antenna lead. The buzzer is thus capacitively coupled to the antenna and the shock excites the antenna circuit into oscillations at its own period. The buzzer is intended to test the adjustment of the crystal and may be used to indicate whether the audion is oscillating. A low hissing sound will be heard in the phones if the buzzer is operated while the bulb or tube is oscillating.

The Beginner's Catechism

By Edward Linwood

HOW can one determine a detector tube from an amplifying tube, provided the tube has no markings on it?

This may be determined only by experiment. Place the tube in the amplifying tube-socket and use between 45 and 60 volts of plate potential. Turn on the filament current and pay close attention to the results. If the tube should happen to turn blue, turn off the current immediately. This test proves that this tube would be a soft tube, making it a detector tube to be used for detecting purposes only. In case the blue glow is not present it is a sure

sign that this tube is an amplifier of the hard-tube class.

* * *

Should B batteries be fixed or variable in order to regulate the flow of current to the plate?

As each tube has its own characteristics, the plate circuit of the detector tube should be variable; that is, whenever a soft tube is employed as a detector. The detector tube being a soft tube of the gas-content type, it is extremely critical in its operation. The variable B battery is essential in order to have correct plate-voltages. For the amplifying tubes, a variable battery

Opera Audiences of To-Morrow

America to Become a Music-loving Nation Through Radio Broadcasting

By Lee de Forest, Ph.D., D.Sc.

OUR recent national awakening to the art of radio and to the possibilities of transmitting music on the Hertzian waves, brings the subject of radio broadcasting very close to the music lovers of America. Certainly, notwithstanding very crude attempts in broadcasting Broadway jazz, the time has come when we may give immediate concern to the opportunity offered by radio in making known the beauties of orchestral and grand-opera music.

We Americans are by no means a musical people—that is, in such measure as are most of the European nations. Familiarity with and liking for operatic music unfortunately is limited to a very small percentage of Americans. Every effort heretofore attempted to make opera at popular prices self-sustaining has met with failure in almost every instance. Excellent organizations, like the Gallo Grand Opera Company, fail to draw even fair houses for longer than a few weeks in any city.

To turn Americans into an opera-loving people, notwithstanding the yearly influx from Europe, would, in the natural course of events, require decades, perhaps centuries. Not that we cannot quickly learn to appreciate good music; but to induce the audiences to go first to hear, and then again to hear, then to appreciate, to understand, to love good music is the great difficulty.

So, to one whose greatest joy and relaxation was to hear good opera, this ability of the radiophone to bring into every home—not second-class opera; not phonographic reproductions—but the actual voices of the highest-salaried artists of the Metropolitan and Chicago Opera companies, appealed to me with strange fascination and aroused a faith which today is as keen, as strong, as when the idea was born.

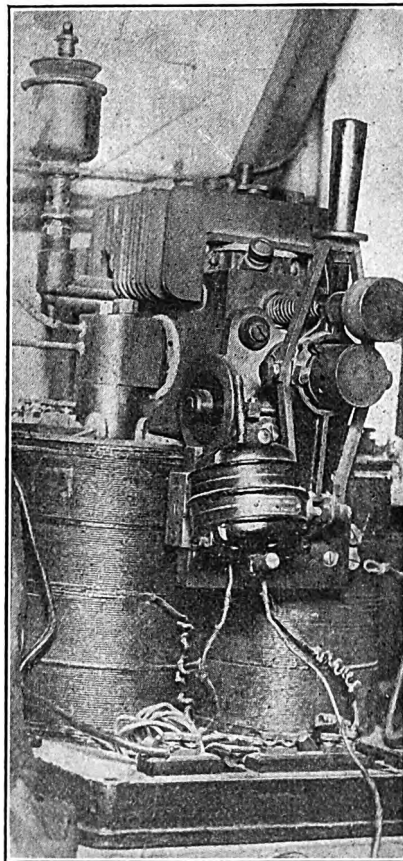
When, in 1907, I first prophesied the era of radio broadcasting, I laid prime stress on what it would mean to the public generally, and to producers of grand opera especially, to send this form of inspiring music to every corner of the land.

Opera impresarios and directors do not, should not, fear that if their

productions are heard in every home in New York or Chicago their box office receipts will suffer one whit. For every twenty who thus hear the arias and more or less fragmentary gems at home, without seeing the gorgeous stage pictures which accompany them, one, at least, who would never otherwise know what beauty he is missing, will be constrained to go to grand opera. Thus the number of opera goers and lovers will be greatly increased. Nationwide education in the best of opera, repeated familiarity with the actual voices of the best artists, can not immensely benefit opera.

I am certain therefore, that, when

Once the Boss!



(C. Central News Photo Service.)

The Poulson arc, formerly used almost exclusively for radiotelegraphy but being rapidly displaced by the vacuum tube. It requires pure alcohol for its operation.

the time arrives, opera directors will be ready to co-operate to their utmost to place in the wings and in the orchestra pits the properly designed sound-collectors which will convert the music into perfectly modulated telephone-currents, to be transmitted by wire to the distant high-power radiophone transmitter; say, to four or five scattered throughout the United States. The United States should set aside a special zone of wave lengths—reserved exclusively for opera and symphony orchestras—so that, on every night of the musical season, a listener may tune in to the Metropolitan or Chicago operas, or to the Boston, Philadelphia, New York, Philharmonic, Kansas City, or San Francisco symphony programs—and, at his own fireside, drink in the very best of the world's music.

If this were the only application of the radiophone, its ability to educate the people in good music, that alone would amply justify the Government, or our musical societies, in endowing and maintaining such a service as I have just described.

In this field of opera and symphony, of high-class concert and chamber music, secrecy of radiophone transmission is quite unthinkable. The better the music, the more general its value, the more the necessity for making the service quite free to all who can hear. The musical organizations which give freely of their product will suffer no loss; on the contrary, they will earn the grateful interest of multitudes who would otherwise never learn of this superb art. And from these new ranks will flock new patrons, new recruits, new lovers of music who will next seek to hear and to know their new found friends face to face.

What will this exquisite musical service mean to the American people, hitherto strangers for the most part, to that fine element in life and education? Maintain this service for ten years and we shall see a national musical awakening the like of which history cannot record! Then, and not until then, will we see a genuine American opera—one worthy to rank with those of Verdi, Bizet, or Puccini—one destined to live!

Radiograms

Latest Important News of Radio Garnered from the World Over, and Reduced to Short Wave-Lengths for the Busy Reader.

IT is estimated that a radio audience of over 400,000 listens in nightly in the vicinity of New York City only. If one could scan any residential section of New York from the top of a lofty building one would be astonished at the myriad aeriels that span the roofs of apartment houses. Besides those who go to the trouble to set up an aerial there are thousands who attach their receiving sets to a bedspring, a fire escape, a telephone wire, or for that matter to such an accessible and commonplace thing as an electric-light socket.

* * *

Over 50,000 residents of Paris now own radio receiving-sets. A society has been formed in the French capital for the purpose of broadcasting, at least three times a day, all news matter dear to the native Frenchman. At 5 p. m., a special communique will be sent out for the benefit of American tourists.

* * *

Radio has led to another arrest. A message from Tarboro, North Carolina, to Suffolk, Virginia, flashed by irate parents of the bride-to-be, landed a pair of elopers in the lock-up. William Barfield, sixty years of age, and Sadie May Hale, fifteen years old, were the runaways, according to a telegram to "The World," New York. Her father and mother refused to permit the girl to wed her elderly cavalier, so the couple decided on an

elopement. They left their homes one day, declaring they were going to a picnic. When the parents of the girl learned that neither had appeared at the picnic, they appealed to a youth who operates a radio outfit near their home. He broadcast a warning to be on the lookout, and the couple were caught as they were searching for a minister.

* * *

The formal opening of the new equipment of WOR broadcasting station, atop the Bamberger & Co. store in Newark, was a big event. A great amount of interest is being taken in the new sending apparatus.

* * *

Two new uses for radio on record. In a dentist's office a pair of receivers on the ears replace the old gas-mask. The patient is so interested in the radio music that he forgets about the dentist and the pain. Even those who have been forced to suffer in silence or mild acquiescence the rambling gossip and advice of the barber may soon find relief in radio. Already one barber has installed a receiver in his shop and the baseball fans will be able to get the scores up to date while being shaved.

* * *

Two new radio stations will be constructed in Manitoba, Canada, for the purpose of facilitating forest fire control. These stations will communicate with the

airplanes patrolling the forests in the eastern part of Manitoba and make possible the swiftest notification of the district inspector of forestry at Winnipeg in case of emergency.

* * *

The Holland government has been broadcasting weather reports by wireless telegraph. It is now planning to send this service by radiotelephone so that farmers who do not understand code will be able to avail themselves of the service. The Amsterdam Stock Exchange sends out bulletins every fifteen minutes by wireless telephone, and after the close of the exchange the station is used for the broadcasting of foreign and domestic news and foreign exchange and stock quotations in code.

* * *

Powerful radio-receiving outfits each costing approximately \$1,000 to install, are fast becoming the playthings of the wealthy campers in the exclusive camp sections of the Adirondack Mountains, New York. As a result, daily reports of the doings of the outside world are received with renewed interest in the seclusion of the Adirondack forests. Experts from New York have just completed installation of such a radio outfit at White Pine Camp, the summer place of Irving W. Kirkwood, of Kansas City, on Osgood Lake at Paul Smith's. Mr. Kirkwood, who is owner and publisher of the Kansas City "Star and Times," is hopeful, in addition to receiving the matter broadcast from all the principal stations, of receiving messages from Kansas City.

* * *

Fourteen out of fifteen broadcasting stations in the metropolitan district (New York City), have agreed to revise their schedules to prevent confusion in the air. Conferences were held May 11 and July 15, when efforts were made to persuade "one recalcitrant member" to agree to a revision of broadcasting periods. A resolution was passed, to which all the broadcasters except the disturber agreed, that the (new) schedule would be put into operation on Monday, July 24, and would be operated continuously thereafter. A copy of this resolution was sent to Secretary of Commerce Hoover and to the Radio Inspector for the Second District (metropolitan area) and to the offending member, with the result that the secretary of the association has received a very cordial letter from Mr. Hoover, authorizing operation under the schedule as agreed upon. It is hoped that it will not be necessary for the Radio Broadcasting Society of America to publish the name of this station that so flagrantly and selfishly ignores the request of the Secretary of Commerce, to the annoyance of most of the listeners in the metropolitan area.

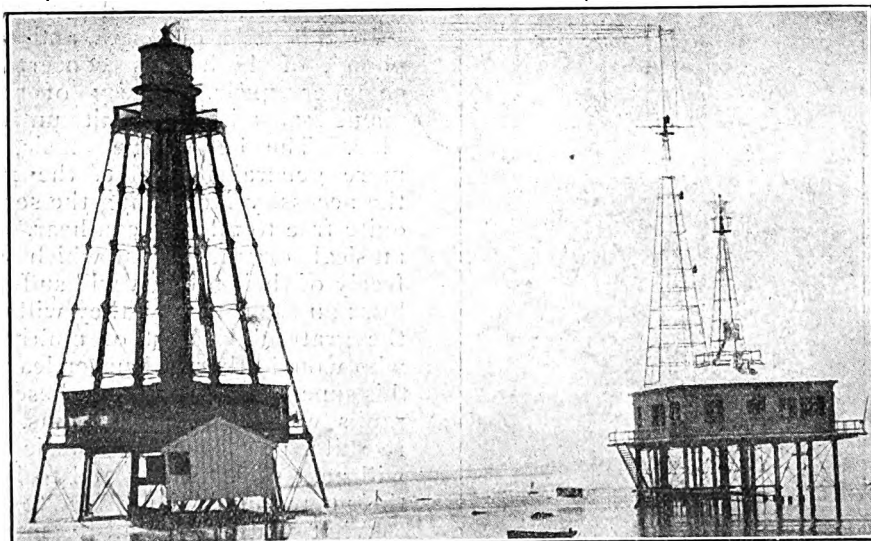
* * *

An enterprising bootblack in Oakland, California, lately installed a receiver and now gives free concerts to his patrons. One customer had three shines in succession while he listened.

* * *

Los Angeles will have radio in twenty of its public schools before the fall sessions begin. The problem of having material broadcast that will meet the standards of the local pedagogues is a worrisome one.

The Light that Never Fails



(C. Underwood & Underwood, N. Y.)

Sandy Key Light House, the radio-equipped sentinel of the Atlantic Ocean, situated off the Florida Coast. This light house has saved many a ship from disaster. At one time the beach-combers along Key West made a profitable living from the ships that went ashore at Sandy Key; but that was before this light house was erected. And this particular light house is a broadcasting, as well as a transmitting, station. The building at the right was erected for the sole use of the radio operators and to house the equipment. The aeriels, as will be seen, are strung from the peak of the beacon to a specially built mast. This station is in constant operation day and night. It is used to broadcast warnings to passing vessels, to inform them of their exact location, to send reports of wind and weather, to give out information in regard to all ports along the Atlantic Coast. In more ways than one has radio proven to be the friend of the seafaring man, and the day will come when it will prove the most valuable element—next to wind and steam—of which ocean traffic can boast.

Radio and the Woman

By
Crystal D. Tector

THERE is so much to write about this week, that I scarcely know where to begin. My set is working splendidly up here in the bungalow colony of Lake Hopatcong. Every evening we are entertaining neighbors, and, Saturday night, we have planned a dance—a radio dance—and some twenty couples are so anxious to attend that I fear they will want the music to begin about the middle of the afternoon.

I have told my guests that they must try and represent some radio element; that is, each young woman is to give herself a radio name and each man do likewise. The partners for the first dance will be those couples with similar names. I realize that a number will take the same word; but leave it to me to straighten out matters so that all will have a good time. Friend Husband says that I should have studied for the diplomatic corps.

I'm going to serve a radio punch—a mild but refreshing concoction that will not bring the blush of shame even to the cheek of Mr. Volstead himself. I make it of iced tea, ginger ale, and grape juice—one third each. Of course, it has about as much to do with radio as a last Easter's hat; but it's the name that counts in such affairs. Gets everybody good natured. And it tastes good. Then I'm going to have static sandwiches and loose-coupler salad. Friend Husband is busy cutting up chicken for the latter. Says he can't see why I should call it by such a name unless the chicken was so old that all its joints were worn loose. Far fetched, but pretty good for a man.

We picked up Bedloe's Island the other night. I didn't hear the announcer—wasn't in time—but the song that came over the waves was beautifully rendered. Of course, Newark is right at our door but it doesn't monopolize the reception. If I were to stay any length of time in this charming spot, I would certainly put in a transmitter and take out a license to broadcast.

I can imagine no more wonderfully fascinating sport than living in this entrancing wilderness and conversing by radio with strangers all over this broad land. It would be wonderful. Fancy the mystery of it all—the wonder—the suspense! Think of getting up in the dead of night—and Hopatcong is blessed with the nightly stillness of death—and hearing from some ship far out at sea! There is romance for you! Think of tuning in on some fellow radio-fan in the Far West! Think of picking up the message of another vacationist in the wilds of Canada! Think of—but better sign off! F. H., says that when I get raving like this I don't know when to stop!

Our colony found three new enthusiasts during the past week. Two hid themselves to New York to buy sets and the third—one of those determined American youths—is building his own set. He is at it from morn till night. He is so anxious to get it finished that his mother cannot even drive him to the dinner table. But can't you imagine how that boy will

just bulge with pride when he hears his first message?

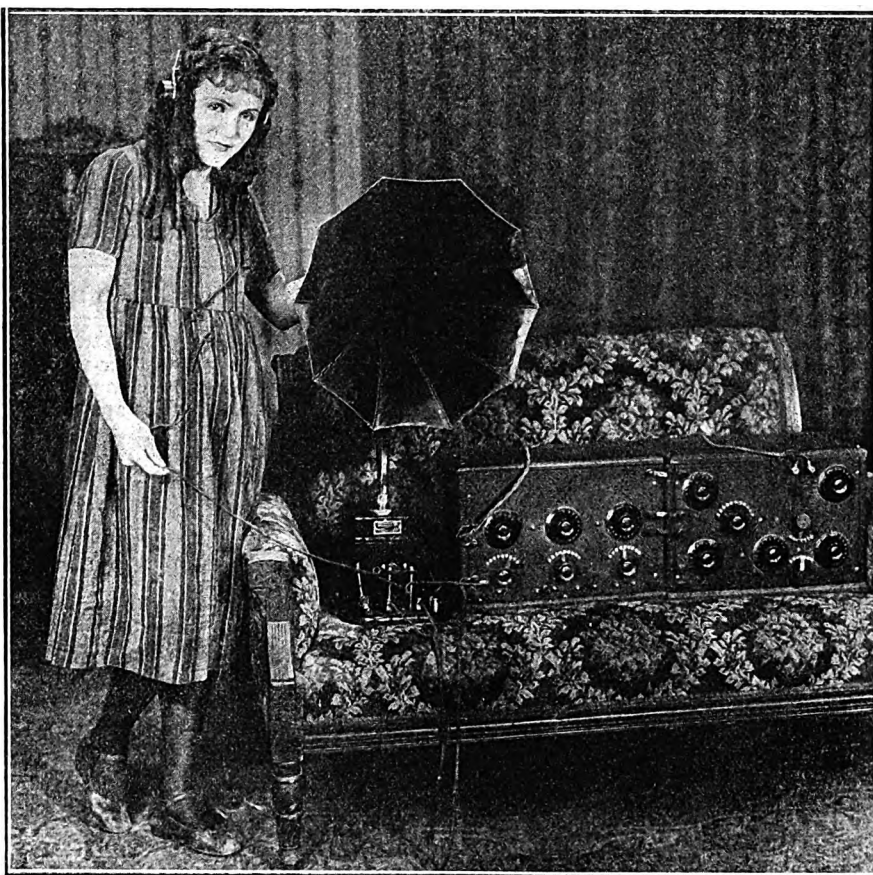
I want to comment on a letter I received this week. It may be a bit personal, but I'm not writing this department for the Antiquated Order of Hasbeens. My correspondent is a Mrs. H. L. O., of Billings, Montana. She wants to know if I can suggest someone who will broadcast information about the husband who has deserted her. I read between the lines of her letter that she would like me to tell all about the recalcitrant person in RADIO WORLD; but as the editors cautioned me to remember always that I am writing for a radio publication, I must sidestep her wishes. RADIO WORLD is not a husband finder. All that I can say to Mrs. O. is to take up her case with some firm in her own vicinity, that has a broadcaster. If they choose to help her, then radio has done one more goodly service.

But the burden of my song is this. Women are taking a deeper interest in radio every day. They find that it possesses elements of service that no other thing in this world can boast of. Grasping its bigger side, they are keen to become familiar with it. That is woman's method of working. I believe the day will come when women, placed in the same predicament as Mrs. O., will turn to radio more quickly than they will turn to the police. But they must understand that the appeal must be made to the right persons or organizations. There are many poor women in this country to whom radio will yet prove a blessing—if the statistics regarding desertion by husbands is true.

I would like to hear from my readers on this subject.

There! Friend Husband has gone and cut his finger—and if I don't hurry that radio salad will be spoiled!

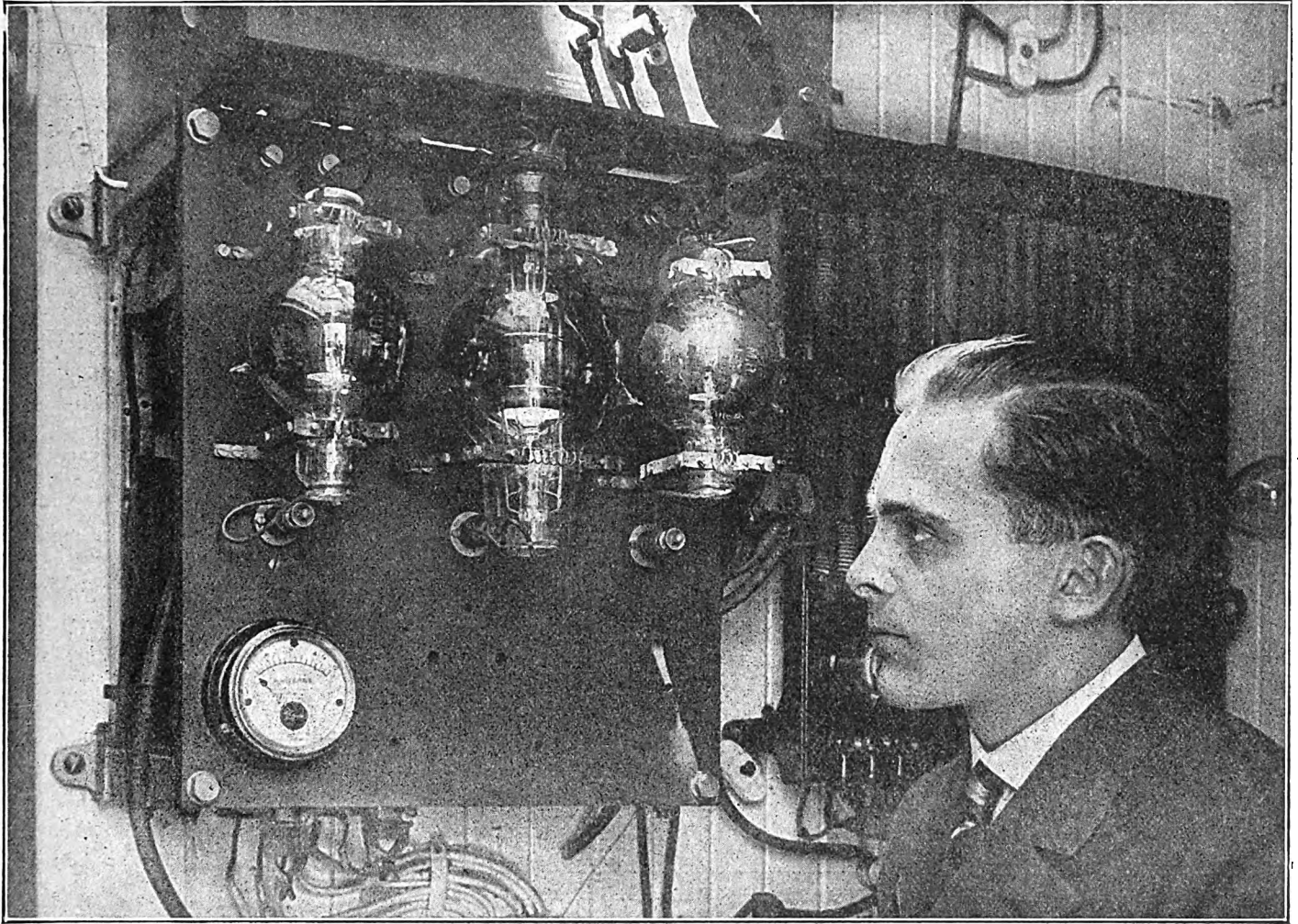
Radio Puts Pep in Her Work



(C. Kadel & Herbert News Service.)

Gladys Walton is a movie actress. She works hard in her chosen calling, and, at times, it is necessary for her to seek recreation. She tried many things to bring diversity into her life—she even went in for athletics—but nothing gave her the fullness of the relaxation she sought until, after the suggestion of a friend, she took up radio. The variety of the programs offered, she says, the suspense in picking up faraway stations and hearing the unexpected has provided a full quota of much needed recreation. Radio has found many ardent advocates among members of the moving-picture fraternity. Out in Hollywood, California, where so many of the big pictures are made, nearly every studio has its receiving set and a number of the more successful stars have sets installed in their homes. Miss Walton's set was temporarily placed in her dressing room.

Radio Is Advancing from Week to Week

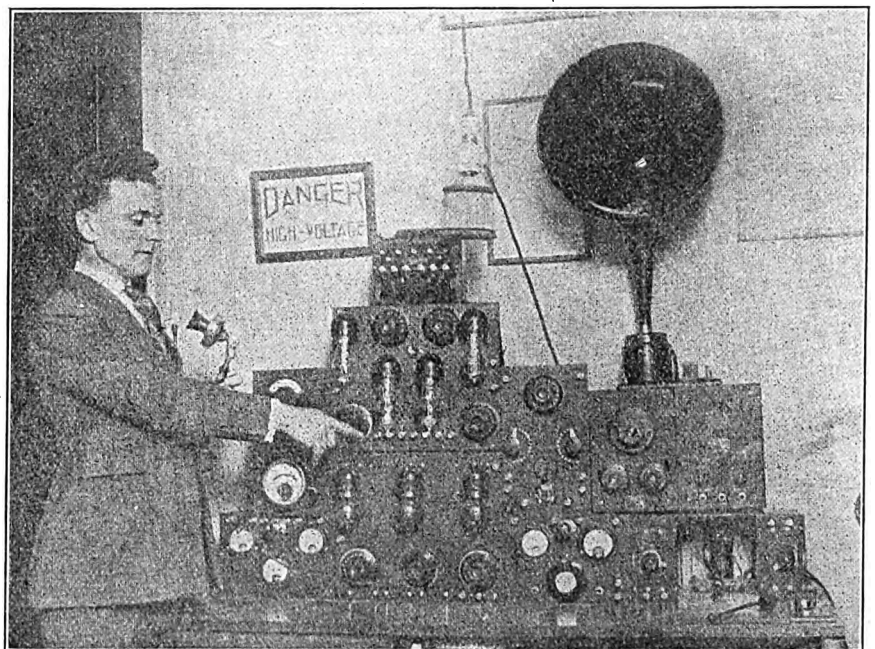


(C. Ewing Galloway, N. Y.)

Here is a transmitter which broadcasts messages 1,500 miles with only $1\frac{1}{4}$ kilowatts of power. This up-to-the-minute transmitter enables steamers crossing the Atlantic Ocean to communicate with America or Europe immediately. The capacity of such an instrument with so small an amount of current is accounted for by a very accurately adjusted aerial. This photograph was taken aboard the Atlantic liner "Vauban," in the Hamburg-New York service. This steamer boasts one of the most perfect radio outfits of any steamer in the world. Her main receiving instrument registered distinctly messages from the Conte Radio Station in the Philippine Islands, a distance of 11,500 miles—nearly half the distance around the world.



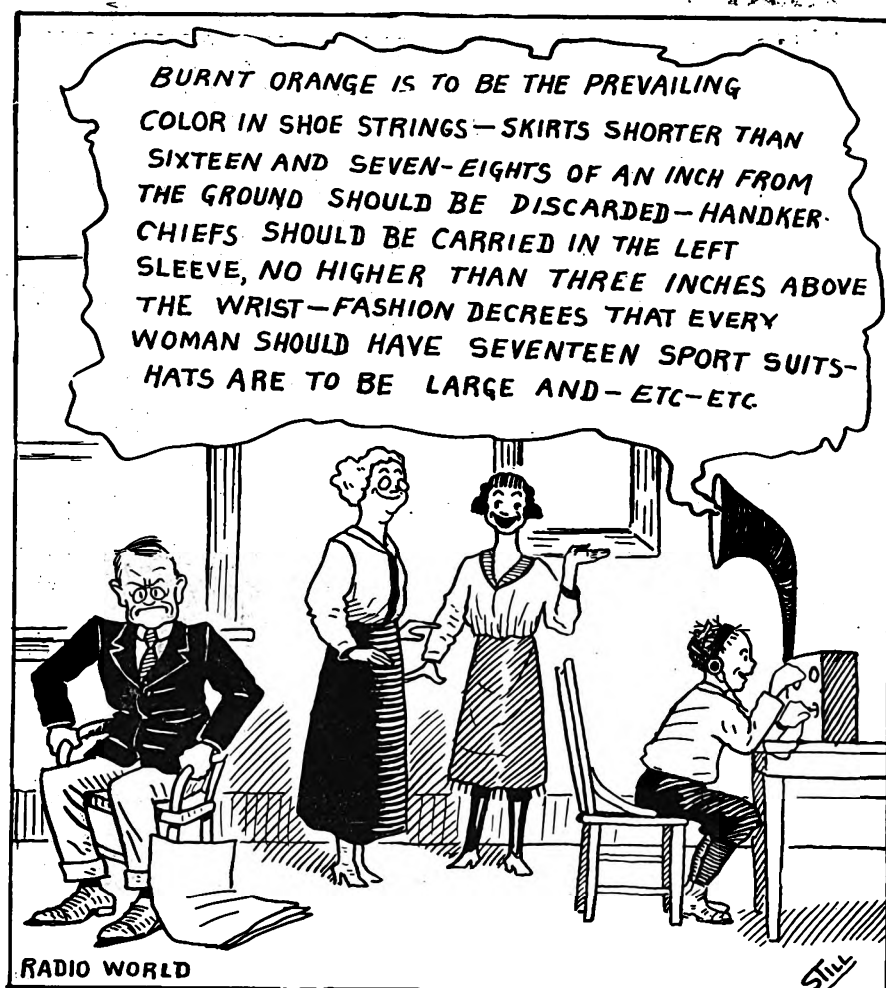
army of American radio experimenters young and old, who have been classed as physicists of high caliber. They find it a constructive source of recreation; but many are intent, hoping to contribute their share to science. At various laboratories, today, they are further advancing both the good work and the search. The above photograph shows one of the men which he is conducting tests to discover the nature of signals.



(C. Kadel & Herbert News Service.)

2WG, the fine home-made set of Walter J. Garvey, New York. It has a range of 800 miles. A number of the parts of this remarkable set was made by Mr. Garvey. It has several unusual features; one in particular: no motor generator is used. Mr. Garvey is pointing to the transmitters that make motors unnecessary.

When Dad Prayed for Static



Cartoon drawn specially for Radio World by Harry B. Stillman.

Answers to Readers

WHAT are the best records for receiving Continental Code?—Mary Mathews, Montreal, Canada.

56 1-2 words a minute. Made by L. R. McElroy, of Boston, at the 71st Regiment Armory Radio Show, in New York, in May. This is the fastest on record.

49 1-2 words a minute. Made by Jose Seron, of New York.

48 3-5 words a minute. Made by B. G. Seutter, of New York.

* * *

How do airplanes and moving motor cars get ground for their radio sets?—Arthur Grant, San Francisco.

They use a counterpoise instead of a ground. The counterpoise of an airplane consists of a wire hung below the machine. In motor cars, the apparatus is grounded on the chassis and engine. The same type of apparatus is used when making a regular ground.

* * *

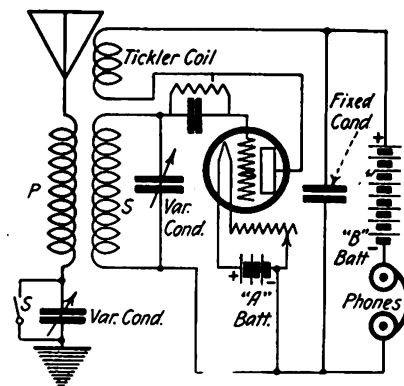
I am located about a hundred miles from the nearest broadcasting station and all I seem to hear is code signals from other radio stations. I have a regenerative set using only one tube as detector.—George Makfield, Crisfield, Md.

If you hear code signals it is a sure sign that your set is in working condition. For this distance secure a two-stage amplifier and connect it up with your detector set. This would enable you

to cover a wider distance and give you louder signal strength.

Show a circuit of a regenerative set using a tickler coil. Show position of tickler, also two variable condensers and variocoupler.—Marshall Van Deusen, Tonawanda, N. Y.

The accompanying diagram shows the circuit you want, study each connection carefully.



Regenerative diagram employing a tickler coil in the plate circuit.

* * *

I would like to know if I can get the working drawings of a Grebe set published in RADIO WORLD No. 13, dated June

24? Where can I purchase brass tubing for the manufacture of tube sockets?—C. C. Powers, Richmond, Va.

The photographs shown in the number of RADIO WORLD to which you refer pertained only to the manufacture of equipment. For blue prints, communicate with A. H. Grebe & Co., Richmond Hill, N. Y.

* * *

I am thinking of purchasing a radio set to cost between \$100 and \$200. What kind of a set would you recommend?—Radio Nuts, Plymouth, Indiana.

For this amount of money you should get a regenerative set with two steps of amplification.

* * *

Where can I get a blue print or drawing of the following circuits: radio-frequency and audio-frequency receiver; also, the new Armstrong circuit?—Alec Ryschik, Springfield, Vermont.

These diagrams happen to be published in this issue of RADIO WORLD.

* * *

Is No. 22 wire O.K. for a variometer? Should the stator and rotor carry the same amount of wire?—Louis Hansen, Los Angeles.

This size wire is advisable, but No. 24 would be more suitable. There must be just as many turns on the stator as the rotor.

* * *

I was interested in an article on radio frequency by George W. May, in RADIO WORLD, No. 6, dated May 6. What is the name of the company that makes the transformer he describes?—Arthur Hendrickson, Duncan, Oklahoma.

The radio-frequency transformer used by Mr. May is made by the Radio Instrument Company, Washington, D. C.

Radio Not to Blame

LIGHTNING exhibited its erratic nature during a heavy electric storm, last week, be setting fire to an amateur radio station on the top floor of a New York apartment house, says "The Times," New York. The lead-in wire from the antenna connected with a lightning arrester and the ground wire, about twenty feet in length, was clapped securely to the water pipe in the bathroom. The insulation was burned off the lead-in from the lightning arrester to the set. The audions were burned out, the "B" battery insulating material fused, and the cords and woven portion of the headband of the receivers were burned off. The window glass was shattered.

The radio apparatus was installed in accordance with the Fire Underwriters regulations and had nothing to do with attracting the lightning. The peculiar position of the lead in wire in relation to the window and a radiator caused the heavy static to start the fire. The lead-in extended down from the antenna to the lightning arrester placed on the window sill. On the opposite side of the window was a radiator and a little to the left of it a table holding the radio instruments. The lead-in, glass window and radiator formed a condenser. The static charge became so great on the lead-in that it discharged through the window glass to the radiator which offered the path of least resistance and shortest route to the ground. The shattered window glass looked exactly like the plate of a punctured condenser.

The same thing might have happened if an ordinary telephone wire or gutter pipe ran past the window. The radio instruments were in no way responsible for the fire.

Radio World, 52 issues, \$6.00.

Subscribe for Radio World, \$6.00 a year, \$3.00 six months, \$1.50 three months.

A. S. C. A. P., Instructs Music Publishers as to Broadcasting

Permission Is Not to Be Given Any Radio Station without Authority of Society

IN accordance with plans made at a recent meeting of the American Society of Composers, Authors and Publishers, says "The Clipper," New York, and the resolution adopted by the society, all professional, branch office, and traveling staffs of publishers who are members of the A. S. C. A. P., have been informed fully concerning the policy adopted by the society relative to the copyrights owned by members and the same being publicly performed through radio broadcasting. The resolution adopted by the society provides that no permission should be given for a radio station to broadcast a piece of copyrighted music without authority first having been received from the society. This, of course, applies only to such music the copyright of which is owned by members of the society.

The chief purpose of the society's reason for informing the different members of the publisher's staffs of the method adopted to have the radio stations get permission to broadcast copyrighted music is to establish the rights of copyright owners pending the arrangements that are now being made between the society and radio stations so that suitable revenue may be paid the owner whose music is being broadcast for profit, should the radio in time prove to be a means of depriving the owner of revenues from the sale of sheet music or rolls and records, which sales are expected to be considerably lessened by the wireless concerts, in time.

Members of the staff were informed by letter which read in part:

"... When the opportunity occurs to secure a so-called 'plug' through radio broadcasting, and in the opinion of the professional or branch office manager the permission should be granted, a telegram along the following lines should be sent to this office:

"Authority requested to broadcast our compositions from WJZ July fifth."

"Immediately upon receipt of such a telegram the society will grant the permission, subject to the following conditions:

"That immediately preceding the broadcasting of each such copyrighted composition a spoken announcement be made, as follows: 'This copyrighted composition is publicly broadcast by permission of the American Society of Composers, Authors and Publishers.'

"When our telegram granting the permission has been received, you may then proceed to grant authority to the broadcasting station, seeing to it that the conditions of the permission, as to the spoken announcement, are complied with.

"Each permission covers the one date of broadcasting, and the station referred to, only, and is not a continuing permission. A new request should be made by telegraph covering each booking for broadcasting, whether from the same or some other station.

"Its effect upon our business, or upon the roll and record business, is as yet problematical, but now is the time for us to establish our rights, . . . or derive from its operation a sufficient revenue to replace that of which we may later be deprived.

"Then, there is another angle which in justice to authors, composers, and publishers, merits our consideration. The industry of 'radio' has come to represent an investment of millions of dollars. Hundreds of manufacturers, and thousands of dealers, are making substantial profits from the manufacture and sale of radio-receiving apparatus.

"There would be comparatively no market for this product, no profit possible from its exploitation, were it not for the availability of music for broadcasting, as a part of the entertaining service rendered.

"If our product, therefore, through its use by broadcasting stations, makes possible the profitable operation of such a huge industry, we are entitled, as a matter of equity and right, to share in the profits flowing therefrom.

"As a matter of law we have an absolute right to control the public performance, for profit, of our copyrighted compositions.

"It may be said to you that the broadcasting stations do not charge anything for their services, and that they do not, therefore, operate for profit. But, except as to schools, universities, municipalities, and public institutions, this argument is not sound.

"Broadcasting stations as commercial propositions, are operated to maintain and increase the interest in the purchase of receiving sets. Though the receiving sets may be sold by firms entirely separate from those which operate the broadcasting stations, nevertheless, practically all of this apparatus is manufactured under a limited number of patents, owned and controlled by the same general interests as own and operate most of the broadcasting stations.

"If broadcasting did not pay commercially, no business firm would undertake the expense of continuing it. If it pays, it pays because in part, music is used and if it pays we are entitled, as proprietors of copyright in such music of ours as is used, to participate in the profits.

More Graft Started

CLEVELAND and Chicago have followed Newark in attempting to establish an inspection and license collecting department in connection with radio. If there is a way for graft, the politicians will find it out.

Although the small fee recommended for a license sounds rather insignificant offhand, it doesn't take much calculation to see that it would amount to a very substantial sum in the course of one year.

If the collection of this fee would do anything to advance the radio art in general, no one would protest; but when it

is used solely for the purpose of fattening some politician's pockets, the matter becomes serious and disgusting.

Should these political buccaneers have their way, every owner of a \$15 receiver would have to pay an installation license. The necessity for this cannot be explained. Ideas of this nature are dangerous. They spread from one city to another rapidly, and with Chicago, Cleveland and Newark as starting points, the new graft may reach New York ere long. If it does, let's prepare ourselves for one mighty battle.—"The Mail," New York.



An essential part of every receiving set

MAGNAVOX RADIO—

The Reproducer Supreme

BEFORE weighing anchor for that pleasure cruise—or packing up to spend your vacation in secluded camp or farmhouse—include a Magnavox Radio along with the rest of your wireless equipment.

It is Magnavox Radio, the reproducer supreme, which makes the receiving set wholly useful and enjoyable.

With the Magnavox Radio you hear every wireless program at its best—your receiving set only brings the message, while Magnavox Radio tells it clearly and in full volume to all within reach of its voice.

To secure maximum power input for your Magnavox Radio, add Magnavox Power Amplifier Model C—2 or 3 stage—designed specially for power tubes.

Any radio dealer will demonstrate, or write us for descriptive booklet and name of nearest dealer.

The Magnavox Co.

Oakland, California
N. Y. Office: 370 Seventh Ave.

Radio Patents

RECENTLY ISSUED

To Keep a Vacuum Tube in Sensitive Condition

No. 1,420,189. Patented June 20, 1922.
Patentee: Aubrey R. Goodwin, Melrose, Mass.

IN radio communication, the vacuum tube is universally used to receive, amplify, and generate oscillations. This vacuum tube consists of an evacuated glass-bulb containing three elements known as the filament, grid, and plate.

Metallic bodies when heated to a dull red glow, or higher temperature, throw off negative electrons. When both the plate and grid are at zero potential these negative electrons are propagated by the filament in all directions. If, however, the plate becomes positively electrified the negative electrons are attracted to it and flow in a concentrated

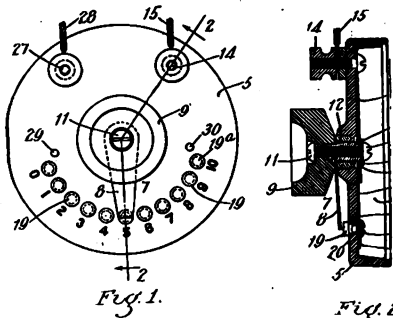


Fig. 1.

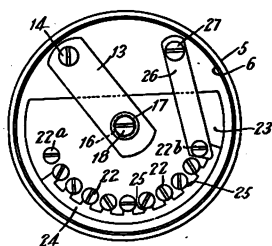


Fig. 3

Schematic diagrams, showing the principles of the Goodwin improvements for vacuum tubes.

stream which is called an electron current. The grid is the controlling member of this stream and is placed between the filament and the plate. If the grid is positively electrified, it aids the passage of the electrons from the filament to the plate, increasing the value of the electron stream. If the grid becomes negatively electrified, it repels the negative electrons, reducing the value of the electron stream, and if the grid becomes sufficiently charged to a negative potential, it may stop the flow of electrons to the plate entirely.

In radio communication also, the circuits are arranged that the incoming oscillations from the antenna act upon the grid, which alternately becomes positively and negatively charged. During the positive charge, however, all of the negative electrons are not removed from the grid, hence the grid during the many succeeding oscillations accumulates a negative charge which is not removed during the positive half of the cycle and materially reduces the flow of the electron stream. It then becomes necessary to use some auxiliary means to remove this excess negative potential, hence the use of the grid resistance, which if of the proper value allows the extra negative charge of the grid

to leak off and keeps the vacuum tube in its most sensitive operating condition.

The amount of this negative accumulation on the grid varies with the incandescence of the filament, the positive potential on the plate, the degree of evacuation of the tube and the gas content of the tube. If the tube contains a considerable amount of gas, part of the excess negative charge on the grid will leak to the filament through the gas itself. In very highly evacuated tubes no such leakage can take place and a grid resistance must be employed. To meet these changing conditions in a tube and the different characteristics of different tubes, a fixed value of grid resistance is insufficient to maintain the tube at its proper operating characteristic. For this purpose Mr. Aubrey R. Goodwin has devised a variable grid resistance, which allows the introduction of the proper leak resistance at will, and, also, an immediate and accurate control of the grid potential and the means for always maintaining the vacuum tube at its proper operating characteristic.

The object of Mr. Goodwin's invention is to provide a device by means of which a vacuum tube may always be kept at its most sensitive operating condition.

How Radio Is Saving Money for Uncle Sam

DURING the month of June, the United States Signal Corps handled by radio 6,102 messages, totalling 218,117 words, which at Government rates for wired telegraph messages would have cost the country \$3,742.47; whereas, the total operating costs of the Army net was only \$1,923.67. The total net saving for the month, by using radio, was \$1,818.80. As the traffic curve is steadily going up, the annual saving will approach \$30,000.

Other Government departments, including the Navy, Shipping Board, and Post Office, are finding that radio is not only fast but inexpensive for official communication. The Post Office Department is constantly reducing its telegraph tolls by use of radio. Besides using 15 radio stations between New York and San Francisco to keep in immediate touch with the progress of its air mail-planes across the country, the department is also using radio for official orders and reports. The cost per word by radio service is less than one-eighth of one cent, according to the Post Office.

In the Navy, radio communication is well known as a money saver; but the operation of the Navy's Radio Piloting Cable in New York Harbor, which is said to save ship operators from \$500 to \$4,000 an hour, depending on the size of the vessel, is not so well known. Since its installation, this cable—enabling ships to enter port in spite of heavy fogs which occur practically ten days a month, delaying ships a day or more—has saved many thousands of dollars to ship owners and operators.

A Silly Question Answered

IN reply to the question whether the large number of thunderstorms which occurred last month were in any way due to radio, James K. Kimball, meteorologist of the United States Weather Bureau of the Department of Agriculture, replied: "There is no more connection between them than there is between the weather and the cigarette which a man in the street happens to smoke."

The Radio "Colyum"

McSMITH: How's broadcasting these days, Old Top?

McJONES: Pretty slow. Haven't heard anything in a week.

McSMITH: What's the matter? Picked up too much static?

McJONES: N-o-o. Needed twenty dollars pretty badly, so I broadcasted the information.

* * *

William Jennings Bryan, who has been broadcasting his speeches, says we get them all with most appropriate gestures. Even though he is not speaking before an audience, he feels the necessity of punctuating his chatter with emphatic gesticulations which enables him to "put over" what he has to say with a bigger punch.

* * *

AMBITIOUS LAWYER: "Why did you break your lease?"

NERVOUS WITNESS: There was a trombone student overhead, a phonograph next door, and a radio set underneath."

THE COURT (interrupting): Case dismissed!

* * *

A Bit from "Life"

Where the radio has it all over the stage is that it enables five or ten million persons to be bored all at the same time.

* * *

Disciple of bucolic regions in Northern Maine says funny papers won't be worth reading soon unless one understands radio.

* * *

IF

(With Apologies to Rudyard Kipling.)

If when everything received is only static—
When "cat calls" drown the music you
would hear,

When the "frying" comes in volume un-
molested,

When "tube noises" only greet your tired
ear.

When your voltage seems to be an awful
muddle

And reception sounds like beating on a
can—

You can calmly smile and say, "It's too
much current."

Then I'll know, my son, you really are a
man!

* * *

"I come from a country where the women are so fascinating that beauty talks by radio are absolutely unnecessary!" howls a Kentucky candidate seeking feminine patronage.

* * *

Our Own Broadcasting Station

OUCH for week beginning August 7, 1922

7:01—Hammock Stories, by members of the Flappers' Union. (N. B.—During the remaining weeks of summer, the Bedtime Stories will be discontinued. We believe that what we shall substitute will be just as interesting.)

7:22—Business Talk: "How to Make a Pretzel Factory Pay in Patagonia."

7:47—Anvil Chorus from "The Baldwin Locomotive Works."

8:10—Very Sentimental Ballads (No. 3): "The Darkest Hour Is Just Before the Pawn."

8:30—Historical Reading: "The American People Before Their Liberties Were Destroyed by the Anti-Saloon League."

9:00—Some things we hope radio will soon explain: "Why the nose always itches when the arms are filled with bundles."

9:26—Annual midsummer dance by the Disturbance Sisters—Coal Strike and Railroad Strike.

9:32—Jess Willard angling for a comeback.

9:51—That Coney Island Lullaby: "Just Hit Me With a Hot Dog and Let Me Die in Peace."

10:00—Correct time from the Railway Rubber Watch Factory.

ROBERT MACKAY.

RADIO WORLD

TELEPHONE, BRYANT 4796
PUBLISHED EVERY WEDNESDAY (Dated
SATURDAY OF SAME WEEK)
FROM PUBLICATION OFFICE,
1493 BROADWAY, NEW YORK, N. Y.
BY RADIO WORLD COMPANY

ROLAND BURKE HENNESSY, Editor and
Publisher, 1493 Broadway, New York.
FRED S. CLARK, Manager, 1493 Broadway,
New York.

ASSOCIATE EDITORS:

Robert Mackay Fred. Chas. Ehler

SUBSCRIPTION RATES

Fifteen cents a copy. \$6.00 a year. \$3.00 for
six months. \$1.50 for three months.
Add \$1.00 a year extra for postage to Canada
and foreign countries.

Receipt by new subscribers of the first copy of
RADIO WORLD mailed to them after sending in
their order, is automatic acknowledgment of their
subscription order.

Advertising rates on request.

Entered as second-class matter, March 28, 1922,
at the Post Office at New York, New York, under
the act of March 3, 1879.

IMPORTANT NOTICE:

While every possible care is taken to state
correctly matters of fact and opinion in technical
and general writings covering the radio field, and
every line printed is gone over with a scrupulous
regard for the facts, the publisher disclaims any
responsibility for statements regarding questions
of patents, priority of claims, the proper working
out of technical problems, or other matters that
may be printed in good faith and on information
furnished by those supposed to be trustworthy.
This statement is made in good faith and to save
time and controversy in matters over which the
publisher cannot possibly have control.

Sounding the Sea By Radio Apparatus

THE word "triode" is so new that it has
scarcely broken into the news col-
umns. It is the semi-official name of a
marvelous little instrument which is the
heart and soul of the radio apparatus, and
which has come to be more or less famil-
iar to the laymen under the name of
"vacuum tube." The triode is so called be-
cause it has three electrodes, says Henry
Smith Williams, in "The American," New
York. The first carrying a looped filament
that becomes incandescent, like any electric
light bulb; the second, called a "plate,"
which connects, in the radio apparatus with
the telephone ear pieces, and the third,
called a "grid," the introduction of which
by Dr. Lee DeForest perfected the "elec-
tron tube" and made it the wonderful in-
strument that it is.

These new names are rather confusing,
but they are worth memorizing because
they refer to the essential parts of what
is perhaps the most sensitive energy trap
ever devised—an instrument that we shall
all hear more about from day to day. As
ordinarily used in the radio apparatus it
"detects" the absurdly feeble current that
comes to the antenna and magnifies it to
the range of audibility.

We are told that a single triode can de-
tect a current of ten microamperes—that
is to say ten-millionths of an ampere. And
an ampere is the unit quantity of elec-
tricity, representing a current conveniently
small for most calculations outside the ra-
dio field. Special combinations of triodes
are estimated to be a hundred thousand

times or even a million times more sensi-
tive.

All this by way of preliminary, to make
intelligible a report that has recently come
from Washington to the effect that tests
have been made in which a specially devised
radio receiving apparatus on a ship has
been able to detect and amplify to audi-
bility the infinitely minute waves of sound
sent down from the ship to the sea bottom,
and reflected thence to the surface pre-
cisely as an echo comes back through the
air from a mountain-side.

When it is recorded that the sound-signal
sent down into the water from the ship
may pass to a depth of two or three miles
before reaching the sea bottom from which
it echoed back, the delicacy of the instru-
ment that can detect the echo will be ap-
preciated.

Merely a scientific experiment, this
would have great interest. But the im-
portance of the test does not stop at that.
Sound travels through water at a uniform
rate of speed (about seven-tenths of a mile
per second), and so the time that elapses
between signal and echo is a measure of
the depth of the water. So a ship equipped
with this apparatus may sound the ocean
at any time and place. Tests may be made
while the vessel is moving at fair speed.

Mr. de Forest's Startling Radio Prediction

DR. LEE DEFOREST, one of Amer-
ica's real pioneers in radiotelephony,
has made the startling prediction that there
would be 20,000,000 receiving sets in op-
eration in 1927.

Dr. DeForest, a conservative scientist
and business man, must undoubtedly have
realized the implications of his predictions,
says "The Globe," New York. He was
probably aware that there are only about
14,000,000 wire telephones in operation, ac-
cording to the latest available American
Telephone and Telegraph Company's sta-
tistics, and that the radio sets in 1927 would
thus exceed the telephones in use.

Assuming, therefore, that there is a good
deal of sound reason behind this startling
prediction, as we fairly may, it is interest-
ing to speculate on the situation five years
hence. Undoubtedly, Dr. DeForest believes
that every family in the United States will,
by that time, own and constantly use a re-
ceiving set. Consequently, we may believe
that by that time broadcasting will have
taken over so many every-day functions
and perform them so efficiently that it will
be considered as indispensable in its way
as the wire telephone. All the experiments
now being made will apparently be adopted
permanently, such as the weather forecasts,
market reports, health and beauty talks,
public speeches and the countless others.

Radio Most Democratic

RADIO is the most democratic of all
forms of entertainment. Tenement
dwellers along with scions of wealth enjoy
the "music in the air." The man on the
farm, the remote camper, the poor boy
who has built his own set, the frequenter
of the big city's crowded streets, the sailor
at sea, the millionaire sitting before his
expensive set—all enjoy the same wonder-
ful wizardry of broadcasting's vast do-
main.

Mahogany Variometers Unwired

Consisting of 2 Staror Halves, 4 1/4 x 1 1/4—Reter
3 1/4 x 3 1/4—Winding Form—And all necessary Brass
Hardware. \$1.50 per set—shipped Parcel Post—
Send Money Order.

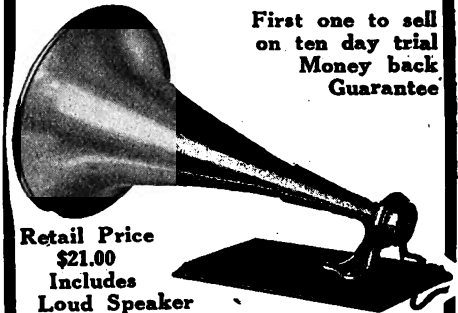
Radio Dept.

ARROW WIRE COMPANY

557 West 35th St.

N. Y. City

GITHENS TRUTONE RADIO HORN—LOUD SPEAKER



First one to sell
on ten day trial
Money back
Guarantee

Retail Price

\$21.00

Includes

Loud Speaker

Trutone has been pronounced the best on the market
by experts. It has a clear true tone. Every radio fan
should try Trutone and compare it with others.

If YOU don't find Trutone the best, your money will
be refunded. It is sold on a ten-day trial money-back
guarantee. If not carried by your dealer write us.

Distributors and Dealers, write!

AUTO PARTS MFG. CO.

1815 Trombly Ave., Detroit, Mich.

For Finer Tuning Use a



Every-Wire-Contact Coupler
LIST \$7.50

Write for Pamphlet

MORELAND SALES CORP.
30 OGDEN ST.

Newark

New Jersey

NEWSDEALERS ATTENTION!

Many of your customers
will want the first eighteen
issues of Radio World. Your
wholesaler may have a few
copies on hand. Inquire. If
you cannot get back numbers
write us and we will try to
supply you so that your cus-
tomers will have a complete
file of Radio World from the
first issue.

If you happen to have a
few copies on hand, keep and
display them and you will
find that they will sell. Very
shortly it will be impossible
to get back numbers of these
earlier issues.

Radio World, 1493 Broadway,
New York City.

Remington Terminal Indicators

5 CENTS EACH



Type A



Type B

A perfect panel engraving imitation. Fits any
binding post. Black japanned, white enameled
letters. Supplied in the following: Antenna,
Ground, Phones, Grid, Input, Output, A Bat +,
A Bat -, B Bat +, B Bat -. Lettering in two
positions. Order direct from ad.

Dealers! Write for Discounts!

REMINGTON RADIO CORP., FRANKLIN, MASS.

COMPLETE YOUR FILE—You can get all
back numbers of RADIO WORLD to date (17 in
all) at 15 cents a copy, or the whole 18 for \$2.65.
Or subscribe at \$6.00 a year, \$3.00 six months, and
we will start subscription with first issue.
RADIO WORLD, 1493 Broadway, New York City.

Latest broadcasting map 15c. That is,
a complete broadcasting map appeared
in Radio World, No. 8, dated May 20.
Mailed on receipt of 15c. Radio World
Company, 1493 Broadway, N. Y. C.

Advertising Rates, Display, \$5.00 per inch, \$150.00 per page

Radio Merchandising

Classified Quick-Action Advertisements, 5 cents per word

Telephone Bryant 4796

After the Showdown

THE great "buyers' strike" of 1920-21, a never-to-be-forgotten event in the economic history of this country, proved a point which must henceforth be recognized as basic and incontrovertible.

It was discovered by merchants and jobbers everywhere, in practically every line of merchandise, that it was the trademarked and adequately advertised brands of goods that got the lion's share of the business there was to get, while the preponderant loss of sales fell on the unbranded and unadvertised goods.

This was a great "showdown" for Advertising. Its position as a factor in economic life was on trial. Had it really done what had always been claimed for it? Had it created consumer preference that would hold against the keen competition of a sacrifice price on unmarked goods?

The verdict of the buying public was unqualified. It was not a straw vote to determine popularity. It was the final test of willingness to buy. The ballots were dollars. And the preponderant majority voted with their dollars that they preferred to keep right on buying advertised goods.

With the whole country on a reduced schedule of production and sales, the factories that were able to keep on producing, in anything like normal quantities, were invariably those making trademarked

and nationally advertised goods.

All over the country today manufacturers, jobbers, and merchants are giving serious consideration to this important and conspicuously demonstrated fact; the public prefer to buy nationally advertised brands of merchandise. And public demand is the last word in all economic situations. No one can go against it and long endure.

This will mean, then, that more and more manufacturers will seek out ways to make their products worthy of a distinctive trademark and a sustained plan of advertising. It will mean that merchants will more and more give preference in their stocks to advertised brands. It will mean that the jobbers will more and more arrange to supply the merchant with advertised brands.

But new advertisers, manufacturers who are finally convinced that their future lies in the direction of an advertised product, will discover that the magic power of advertising cannot be applied overnight. It may require sustained effort to attain a position of equality with competitors who have been advertising for many years. This will be an unwelcome discovery. But it will be found to be the truth, and will be their only hope of gaining a substantial foothold in what, from now on, must continue to be a more keenly competitive market than we have known for a generation.

Published by RADIO WORLD in co-operation with
The American Association of Advertising Agencies

Improves Audibility of Head Sets

The Radio Mica Products Company, 156 East 43d Street, New York City, is the manufacturer of Mica Diaphragms which they claim, when inserted in head sets instead of the ordinary tin discs, greatly increases the audibility. Mica is a mineral imported from India. It is very resilient and elastic, and gives great amplitude of vibration and, therefore, more volume.

A Correction

Through an error RADIO WORLD neglected to state in the advertisement of the Pioneer Radio Products Company that its French Brunet Head Sets has an ohmage of 4,000. These phones were tested by "The New York Mail" and the New York Edison Company, and were found to be over 4,000 ohms. The Pioneer Radio Products Company is located at 329 East 29th Street, New York, and Mr. Arthur Pudlin is general sales manager.

New Firms and Corporations

Notices in this department are considered as purely interesting trade news and published without compensation to us. We welcome trade news of this nature. All notices having an advertising angle are referred to our Advertising Department, and are placed under Classified Advertising at 5 cents a word, or as Display Advertising at \$5 an inch.

(The firms and corporations mentioned in these columns can be reached by communicating with the attorneys, whose addresses are given whenever possible.)

Melville Boyd for Bailey Electrical Supply Co., 26 Warren St., New York, with bond of \$20,000.

Triangle Radio Equipment Co., manufacture machinery, \$300,000, Wilmington, Del. (Attorney, Corporation Service Co.)

American Radio Exposition Co., Del., 2,000 shares preferred stock, \$100 each; \$10,000 common, no par value; Representative, H. Bolster, 120 Broadway, New York, N. Y.

Harlem Valley Electric Corp., to operate in Dutchess and Putnam Counties, \$100,000; J. G. Deane, W. Cook, Jr., R. Malden. (Attorney, Deane & Cook, 15 Park Row, New York.)

Coraco Co., Wilmington, radio, \$500,000. (Colonial Charter Co.)

The Niagara Falls Radio Co., 1026 Cleveland Ave., Niagara Falls, N. Y.

Mercury Radio Products Co., \$100,000; Edmund E. Osborne, Baynard D. Browne, Myron S. Shields, Montclair, N. J.

Eastern Radio and Electric Co., \$100,000; Wilmington, Del. (Attorney, Delaware Charter Co.)

Standard Appliance Mfg. Corp., Manhattan, make radio supplies, \$50,000; A. P. Link, A. Hopp, E. Konzelman. (Attorney, R. L. Scott, Jr., 63 Nassau St., New York.)

Picardo Radio Corp., Manhattan, \$300,000; M. Halsted, W. T. Little, C. B. Pechtle. (Attorney, W. F. Carrell, 16 Exchange Place, New York.)

Radio Leather Goods Co., Manhattan, \$5,000; J. Tabashnik, V. Baris, N. Brevda. (Attorney, L. Dinkelspiel, 5 Beekman Street, New York.)

Unsurpassed Credit

IN SPITE of the coal strike and the threat of railway troubles, confidence in the American business outlook remains strong. Conditions have been steadily improving, and the expectation of the shrewdest observers of our economic life is that the betterment will continue and be enlarged. One evident basis for this optimism is the splendid credit which the United States Government is now enjoying. Nowhere in the world is it equaled.

All the Liberty bonds are now selling virtually at par. Few stop to realize the enormous financial transactions of the Government during the past five years. It issued bonds to the extent of nearly \$30,000,000,000 and even after the redemptions that have been made, the total gross debt of the United States on June 30, 1922, was almost \$23,000,000,000. Those who did not believe that the Government bonds would be worth their face value, and sold them at a sacrifice, now see their mistake. It still remains safe to "bet on the United States."

It is true that the present high price of Government and other bonds indicates an abundance of unused funds, flowing into investments.

Last-Minute Radio News

W. H. Davis, of Pennie, Davis, Marvin & Edmunds, New York, was elected president of the temporary organization of the National Radio Chamber of Commerce at its first convention, held in Washington, D. C., July 26. Dr. L. du Plessus Clements, speaking for Secretary of Commerce Hoover, said: "We have the opportunity to become the leaders of the radio industry throughout the world. It is up to this convention to fulfill the important task of creating a National Radio Chamber of Commerce, so powerful and progressive that the radio industry of this country can introduce American standard supplies throughout the world at American prices. Radio is a coming public utility, even more important than the telegraph and telephone."

* * *

The United States Patent Office announced that it has already issued a thousand radio patents and has nearly three thousand more pending.

* * *

Quite a furore has been raised in Austria by the action of the government in granting a wireless concession to the British Marconi Company instead of to a German firm which offered the same terms. The Socialist press has made this concession a new ground for attack on the government.

* * *

The threatened radio war between two broadcasting stations in Newark, N. J., has been happily averted by one station closing down while the other is operating. The department store of L. Bamberger & Co. (WOR) opened a broadcasting station, but as its operation simultaneously with the high power station of the Radio Corporation of America and the Westinghouse Company would have created confusion, the new station appealed for an hour for its program, but there was no intimation that the other station, WJZ, would close up during that hour. WJZ agreed not to interfere while WOR is broadcasting.

THERE IS MONEY IN THE AIR

"RADIO CURRENCY" IS AN ELECTRICAL COMMUNICATION THAT IS CASHING IN DIVIDENDS.

RADIO AS A NEW INDUSTRY GIVES PLENTY OF SPACE FOR MAKING WEALTH. Its popularity is sweeping the country and is spreading throughout the World like wildfire.

NORRIS RADIO CORPORATION, ESTABLISHED SINCE 1913 AS THE NORRIS ELECTRIC SPECIALTIES CO., having among its customers U. S. Government, Western Electric, General Electric, Penna. R. R., New York Central, Interborough, B. R. T., Radio Supply Co. of Calif., is a medium by which you can plant your seed for unlimited possibilities.

RADIO, THE EIGHTH WONDER OF THE AGE, BECKONS TO YOU, like the telephone, telegraph, automobile, motion picture and phonograph industries did years back. Norris Radio Corporation is expanding. Together with its patents, one of which appears on page 27, the corporation is coming out with a new type of radio set which is a sensation.

TAKE IMMEDIATE ADVANTAGE OF THIS OPPORTUNITY
FOR ANY INFORMATION WRITE OUR SECRETARY

NORRIS RADIO CORPORATION

126 Liberty Street, New York

WRITE PLAINLY

To NORRIS RADIO CORPORATION,
126 Liberty Street, New York City, N. Y.
I would appreciate information on Norris Co-operative plans, also copy of "Out of the Air."

Name

Address

City State

Occupation

The company's shares are being offered at \$15.00 per unit, consisting of one share 8% Preferred and one share of Common, \$10.00 par value on each. Rapid advance in price on the units is predicted.



Remember that although there are several makes of honeycomb coils on the market, there is only one line—the De Forest—which is *duo-lateral*.

Honeycomb coils were used by Armstrong in his three-tube circuit, and the convenience and efficiency of the De Forest method of mounting, with the new spring plugs, greatly facilitate the adjustments which are necessary before this circuit can be made to operate. Insist on DeForest DL Coils and be sure of dependability.

**DE FOREST RADIO
TEL. & TEL. CO.**

Jersey City, N. J.



-A L-O-U-D S-P-E-A-K-E-R-
in a jiffy so all can hear by using the "PHONE-ADAPTOR," fits Edison, Victor, Sonora, Columbia and Pathe phonographs. Threaded to fit the leading makes of headphones. Specify make of phonograph and headphones you have. Satisfaction guaranteed or money promptly refunded. Best postpaid anywhere. Nickel finish \$1.00; Gold finish \$1.55. **SEND FOR YOURS NOW.** Dealers write for literature and attractive discounts.
HARRY D. CROMER, Room 919
30 Church Street New York City

"SPAGHETTI"
VARNISHED TUBING
"EVERYTHING IN INSULATION"
VARNISHES, COMPOUNDS, PAPER, ETC.
MITCHELL-RAND MFG. CO.
24 VESEY ST., NEW YORK, N. Y.

HERE THEY ARE!

EBY

BINDING POSTS

See them at your dealers.

Corporal Ensign "H"

H. H. EBY MFG. CO., PHILA., PA.

RADIO SUPPLIES—
RADIO SUPPLIES

We carry a full line of Radio Goods
Dictograph Head Sets, Vario
Couplers, Everett Head Sets,
Variometers, Transformers,
1700 Meter Loose Couplers,
Dials and Knobs.

Send 50c for 20 Blue Print
Hook-Ups

Radio Sets Made to Order
SUNBEAM ELECTRIC CO.
71 3rd Ave., New York City

Subscribe for **RADIO WORLD**. \$6.00 a year, \$3.00 six months, \$1.50 three months.

The Result of Radioed Optimism

THE first radio speech by a person who couldn't deliver it in person was sent out from WJZ, Newark, about two weeks ago. The letters responding to it are still coming in and they are addressed to Nellie Revell.

And those letters break the record for WJZ's responses. Bushel baskets hold them.

You see a clever young woman had thought of broadcasting Mrs. Revell's cheery optimism, but doing it in the second person, so to speak, because Mrs. Revell, tied to her bed for three years now, couldn't stir from the hospital. The rulers of WJZ had objected to the idea at first, fearing all personality would be lost in the vicarious transmittal of the Nellie Revellisms.

They have been converted now and Mrs. Revell has promised that about the first thing she does after she gets up will be to go to WJZ and talk to the farflung radio receivers that nightly, in cottage and apartment, open their ears to the mysterious words from the air.

Whistling Beats Broadcasting

AMERICAN manufacturers of radio broadcasting and receiving devices might just as well pass up the Canary Islands as a market for their instruments, is the opinion of American Consul F. A. Henry, at Teneriffe. There is not a chance, says the consul, particularly on the remote island of Gomera, to compete with the "whistling language" of the natives. The inhabitants of this island, by use of a system of whistling signals, can convey news and information over considerable distances with great rapidity. The system dates back hundreds of years, says the consul's report, consequently radiotelephony is practically unknown.

PATENT
Your Radio Ideas.
Call or Write
FREE ADVICE

ASK MANUFACTURER
PATENT CO.
FOR
520 FIFTH AVE.
NEW YORK

Rocky Mountain Crystals

BETTER THAN GALENA
The most sensitive mineral rectifier known. Can also be used with one or more stages of amplification.
Mounted, 35c.; Unmounted, 20c.; Postpaid
Manufacturers, Jobbers, Dealers, Clubs,
Apply for Special Trade Prices
Rocky Mountain Radio Products, Inc.
9 CHURCH ST., NEW YORK, N. Y.

VARIOMETERS
UNWIRED

Mahogany wood turned cup, white wood ball ready for wiring. Range 175 to 600 meters. Ready for immediate delivery in any quantity. Workmanship guaranteed.
SAMPLE SET, \$1.10

The Ever Ready Woodworking Co.
810-12 East 5th St., New York City
Phone Orchard 5585

SWELLS
EVERY NOTE
INTO FULL
RICHNESS
MAKES YOUR
OUTFIT ~
COMPLETE


\$5.00 AT ALL GOOD DEALERS
WITHOUT RECEIVERS

SHELTONE
LOUD SPEAKER

CASTINGS
BRASS, BRONZE, ALUMINUM

Our Motto
"SERVICE"

THE ANCHOR BRASS & ALUMINUM CO.

Ninth and Freeman Sts.
CINCINNATI, OHIO

Common Sense Facts in Regard to Lightning

LIGHTNING is the result of a discharge of electricity between a cloud and the earth. This discharge often amounts to millions of volts, which sounds very dangerous, but isn't, if it strikes somewhere else. Be assured, that lightning is not going to follow you around and seek you out for a little light diversion. It seeks the fastest way out and the shortest way down. If your aerial is properly erected and grounded, it will tend to equalize the electrical strain between the charged clouds over your roof and the earth beneath you, in very much the same way as a lightning protector, or lightning rod.

In other words, a properly erected aerial is a lightning protector and is, therefore, a safeguard, if anything, against lightning. The possibilities of a single-wire aerial as an equalizer between the charged cloud and the charged earth, may not be very great; but it certainly can not, by any stretch of the imagination, be termed an attraction to lightning.

Assume that the electrical energy in a cloud decides to come to earth. A single, No. 14 wire, strung as an aerial over your roof is not going to affect the going or coming of the lightning flash in the least. The entire mass of wire in your aerial won't move a million-volt lightning flash one iota of an inch. It is like trying to use a one-inch horseshoe magnet to draw a locomotive from its rails when it is speeding at sixty miles an hour.

Lightning arresters are of value mainly to protect instruments from the extra heavy current charges caused by excessive static and from high-potential current induced by lightning discharges taking place at a distance. But they offer no protection from a direct bolt of lightning—at least, no more protection than the mistaken idea that an aerial offers attraction.

The similarity between an aerial, properly grounded, and a lightning rod, is sufficient to cause the statement that a good aerial, well erected and well grounded offers the same protection against lightning that a lightning rod does. And this is effected, by the fact that the aerial and the lightning rod both tend to equalize the electrical potentials between the earth and the clouds above, thus preventing, to some degree, the lightning flash caused by the difference in potential between the earth and the clouds immediately above.

A. M. S., Does Good Work

THE Air Mail Service is doing some wonderful pioneer work, despite the fact that Congress has been extremely niggardly in allotting appropriations to that important radio branch. It is laying the foundation for the future commercial air transport that will revolutionize physical communication in this country. In addition to this, however, it is also developing the most modern form of instantaneous communication which will materially aid in removing the last remaining preventable cause of aircraft danger.

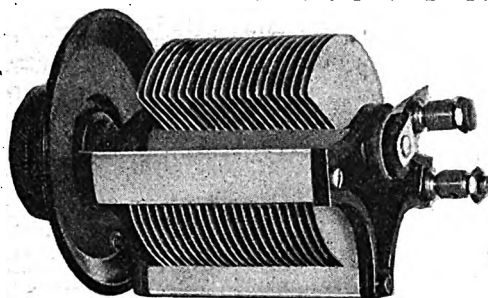
Radio's Great Field

RADIO communication and the radio transmission of power offer a great field for experiment. The ether holds a secret which is yet in profound darkness. Some even say that there is no ether. What is it, then, that carries these extremely useful impulses that we call waves? The solution of this problem may unlock material that will enable all the present difficulties to be understood and surmounted. Let us work to this end.—Kenneth M. Swezy in The Globe, New York.

Fifty-two issues for \$6.00. Sub. Department, Radio World, 1493 Broadway, N. Y. C.

The Bayley Variable Condenser

THOROUGHLY INSULATED



3-inch Dial and Knob for 1/4 shaft with recessed White Enameled Degrees on black ground75c

\$4.50

Packed in Strong Box.
Complete with Full
Instructions.

Money Back Guarantee

If returned in same condition as
when received within 10 days.

The Bayley Variable Condenser is of good and pleasing design and high class workmanship. Steel Spindle with long bearing insures true running without any side lash. The 43 plates are spaced close, giving the finest tuning qualities. PLATES ARE ASSEMBLED AS A SOLID INTEGRAL PART OF THE WHOLE, BY THE DIE CAST PROCESS. IMPOSSIBLE FOR ANY PLATES TO LOOSEN IN SERVICE. Binding Post drilled with screw and lash nut also with soldering point attached. May be hooked-up three ways.

A metal spring under dial for ground wire to cut out body static from condenser. A 3-inch Dial and Knob with recessed white enameled degrees on black ground. Also a diagram label to place on board, showing where to drill holes for spindle and screws, insuring perfect registration with condenser, without measuring or marring the board.

To Jobbers and Dealers We Offer a Splendid Proposition.

Write for Particulars.

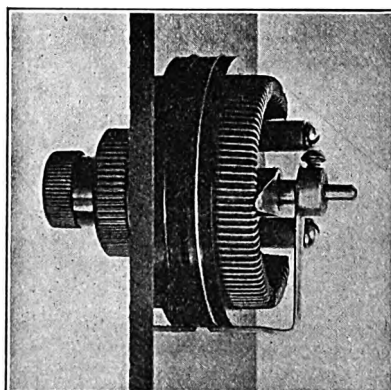
BAYLEY CONDENSER CO.

105-109 VANDERVEER ST.

BROOKLYN, N. Y.

Improved Vernier Rheostat

An absolute necessity in the new Armstrong
Regenerative and in Radio Frequency
Amplification



VERNIER

With Dial\$2.00

Without Dial\$1.50

REGULAR

With Dial\$1.50

Without Dial\$1.00

We are the only manufacturers
selling a regular rheostat with dial
for \$1.50.

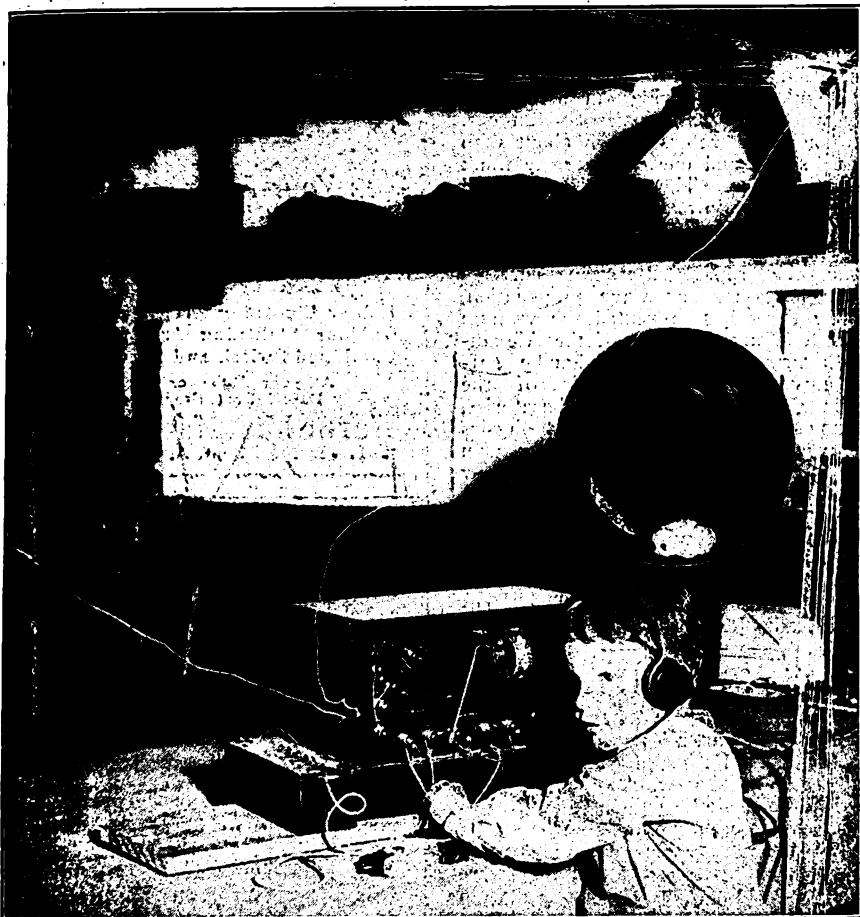
MAXIMUM DISCOUNT TO DEALERS

THE TECO RADIO CO.

P. O. Box 3362, Boston, Mass.

Factory: 165 High St., Waltham, Mass.

Even Little Boys Listen In



(C. Underwood & Underwood, N. Y.)

This is not an unusual photograph. It was the little fellows who first made radio popular. They take to it with a particularly natural fervor. This youngster, only five years old, can tune it—just as well as his dad.

May Broadcast Niagara

THE falls of Niagara can be heard only ten miles away under atmospheric conditions favorable for the transmission of sound, while the Hertzian waves of the wireless extend completely around the earth and on into the infinite. In 1896, just at the time Marconi was making his first attempts to span the Atlantic with wireless, the roar of Niagara was transmitted to an electrical exposi-

tion in New York by the telephone. The event was heralded as one of the greatest achievements of the time. Twenty-six years have passed and it is safe to say that it soon will be possible to broadcast "The Thunder of Mighty Waters" by radio so that it can be heard in any city in Europe or in the Orient at the same time the deep rumble is heard in the gorge at Niagara.—"The Times," N. Y.

An Epoch-Making Advance in Vario-Couplers

The New Norris "Selector"

Every dealer should sell this new Norris "Selector" Vario-Coupler because it is an instrument each "Fan" will want. It combines in one compact unit, an efficient and accurately designed vario-coupler and the necessary tuning switches. It is actually three instruments in one as separate controls are provided for both the coupling and each of the two primary switches.

The "Selector" works easily and gives a very fine adjustment on each of the three controls.

Radio Fans can easily install this new Vario-Coupler on their sets with a great saving of panel space.

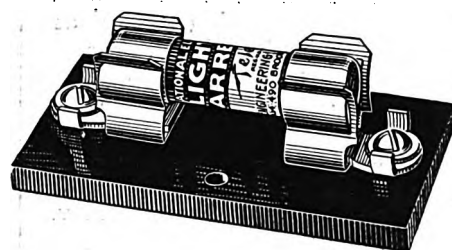
Radio Jobbers and Dealers—

Write us now for full particulars and attractive discounts.

JOIN NORRIS RADIO CLUB
SEND FOR BOOKLET NO. 4

Norris Radio Corporation
126 Liberty Street, New York City

Only \$1.00



Teleradio Lightning Arrestor

THINK of it! Only \$1 for the Teleradio Lightning Arrestor!

Here is a guaranteed Lightning Arrestor that has been approved and passed by the National Board of Fire Underwriters, and has been granted the Electrical Number 5837. This is the only Lightning Arrestor that we know of that has been passed by the proper authorities and that sells at so low a price as \$1.

The Teleradio Lightning Arrestor is made for either outdoor or indoor use and is a permanent protection against lightning, without in any way interfering with the perfect reception of radio broadcast or code signals.

The Teleradio Lightning Arrestor is the result of over 10 years' experience in the manufacture of electrical apparatus, and each Lightning Arrestor is guaranteed to be mechanically and electrically perfect.

Teleradio Lightning Arrestors are the latest addition to the Teleradio line, so if your dealer has not yet stocked them, order direct from us. Enclose dollar bill, check, or money order, mentioning your dealer's name and address. The coupon is for your convenience.

Ask your dealer to show you the Teleradio Vacuum Tube Protector and Teleradio Supersensitive Phones.

Jobbers and dealers—write for prices and proposition on the nationally advertised Teleradio line. Immediate shipment. Orders for Teleradio Lightning Arrestors now being filled.

Teleradio Engineering Corporation
484-490 Broome Street
New York

COUPON

Teleradio Engineering Corporation,
484-490 Broome St., New York (Dept. B.).

Please find enclosed dollar bill, check, or money order. Kindly send me by return mail prepaid, one Teleradio Lightning Arrestor.

Name

Address

Dealer's Name

Dealer's Address

Radio Trade Directory

**National CARD CATALOG of
Radio Dealers, Distributors,
Jobbers, Indicating Class as
Exclusive, Wholesale, etc.**

Compiled from Information Secured from
Chambers of Commerce, Manufacturers, etc.

Circular and Sample Cards upon Request.

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AND SERVICE**

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Dealers All Over the Country
Handle Our Standard Radio Goods.

**OUR TRADE PRICES
AFFORD GOOD MARGIN.**

Write for catalogue and price list.

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SPECIALTY COMPANY**

21 ACADEMY STREET
NEWARK NEW JERSEY

Let The World Talk To You
Thru The Marvelous

PAN-AUDIO

TYPE CF-3 AMPLIFIER

THE PAN-AUDIO Three Step Amplifier was designed by expert radio engineers for those who demand the maximum of high frequency, scientific construction, appearance and workmanship in radio apparatus.

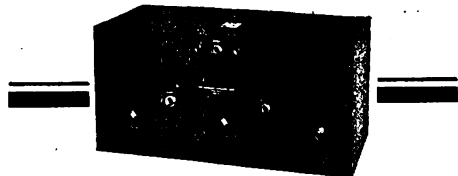
The PAN-AUDIO is absolutely free from all howling and distortion. Unlike the average amplifier, it reproduces speech in natural tones, every word of which can be clearly understood.

The PAN-AUDIO Amplifier provides a high class radio outfit, noted for its simplicity of operation, clearness of tone and handsome appearance. It is the ideal set for receiving the broadcasting of music, lectures, concerts, time signals, news items, stock reports and weather forecasts.

The PAN-AUDIO is made of solid mahogany, hand rubbed to a furniture finish. The panels are of best grade bakelite, carefully engraved, with nickel-plated binding posts and invisible wiring. May be used with any type of receiving set.

Ask your dealer to show you the PAN-AUDIO today. If he hasn't got it write us direct for illustrated literature and full details.

The Wireless Appliance Corporation
513-C Sixth Avenue New York



52 Weeks for \$6.00
Complete Your File of RADIO WORLD
Copies of Radio World No. 1

If you did not get a copy of Radio World No. 1, send us \$6.00 and we will send you this paper for one year, and start it with our first issue, which will be mailed you as soon as possible after receipt of order.

Latest broadcasting map, 15c. That is, a complete broadcasting map appeared in RADIO WORLD, No. 8, dated May 20. Mailed on receipt of 15c. Radio World Company, 1493 Broadway, New York City.

Little Tube Does Big Work

IT is not always the big machine that performs most efficiently. The great Alexanderson alternators used in the trans-oceanic radio-stations are marvels of workmanship and masterpieces of engineering design. They stir into being the great ether impulses that swing out across the watery wastes in the twinkling of an eye. Their ponderous rotors whirl about with appalling speed, and one can scarcely think in their presence. The tiny glass-incased vacuum tube can do all of the tricks of the big alternators. Silently, yet with marvelous efficiency, the little vacuum-tube can generate the rapidly alternating currents that are necessary for wave propagation. Only one thing has prevented the vacuum tube from taking the place of the Alexanderson alternators—ability to handle sufficient current. Now Langmuir of the General Electric Company's laboratories, who knows more about the actual physics of the vacuum tube than any other man living, announces the invention of a new tube that will allow great volumes of current to pass. This tube has numbered the days of the big alternators. In the near future twenty little glass bulbs on a shelf will do the work that is now done by twenty tons of steel and wire.—"The Evening Mail Radio Review."

Radio Train Records

EDITOR, RADIO WORLD: Referring to the article appearing in your publication No. 16, dated July 15, "Fast Frisco Train Makes Radio Record," by Robert M. Reed, Radio editor, "Daily Oklahoman," I quote the following paragraph: "The most remarkable thing about the tests made on the Frisco is that they were received for more than ninety miles from a broadcasting station with only a 20-watt set, while the Lackawanna in an earlier test used a 100-watt set and received only from twenty-five miles distance from the broadcasting station. So clear were the signals received on the Frisco trains, with only two stages of amplification, that it was almost impossible to remain comfortable in the car."

For your information, a 15-watt transmitting set (instead of 100-watt outfit), was used on the Cornell Special, April 5, 1922, with antenna only 14 to 18 inches from the roof of the car. As to the distance broadcasting was and is being received from transmitting stations, WGY at Schenectady, New York, was heard so loud just outside of Ithaca, New York, on a Magnavox loud-speaker, April 5, a distance of approximately 140 miles by "air" line, that it was necessary to shut down the instrument in order to be heard comfortably.

At the present time, when late concerts are broadcasted from WGY at Schenectady, same are heard from Delaware Water Gap, Pennsylvania, a distance of about 100 miles in a straight line from Schenectady, and Anacosta Station, District of Columbia, is heard frequently on regular equipment now being used on Lackawanna Train No. 12, from Mt. Morris, New York, which is a distance of approximately 200 or more miles in a straight line.

Further, in 1914, wireless 'phone conversations were conducted between the Lackawanna Limited at Scranton, Pennsylvania, and a receiving station at Binghamton, New York, a distance of 60 miles.

These distances can and will undoubtedly be bettered, according to transmitting set used by broadcasting stations in the future; but I am merely giving this to you for your information, as I have been on the stations.—A. J. Rubin, Boonton, New Jersey.

Subscribe for RADIO WORLD. \$6.00 a year, \$3.00 six months, \$1.50 three months.

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Is Your Home Properly Protected?

Is Your Insurance Valid, If Lightning Strikes?

HORNE Lightning arresters are approved by fire underwriters

Indoor Lightning Arrester.....\$1.00
Outdoor Lightning Arrester....\$1.50
Combined Switch and Arrester..\$2.50.

At your dealer or direct by Parcel Post Prepaid from

Horne Manufacturing Co.
30 Church St. Dept. A. New York City

COIN MONEY MAKING RADIO SETS AND PARTS

RAD-I-CO COIL WINDING LATHE,
Complete, Delivered, \$5.00

SPECIFICATIONS:

This is a real manufacturing machine for quantity and quality production of variometers, variocouplers and any coil or wire winding proposition used in radio.

It has a 7-in. swing, 20-in. between centers with adjustable tail stock. Two tube and rotor chucks adjustable to any size from 1 in. to 7 in. inclusive. Automatic wire spool holder and feeder (insuring tight even winding). It will accommodate tubes, rotors or stators up to 7 in. diameter and up to 20 in. long.

Furnished for hand or power drive. Strong, accurate and rigidly built of all malleable and wrought iron. Highly enameled finish, practical for manufacture as well as amateur. Guaranteed to satisfy, shipped on trial, terms cash with order.

RAD-I-CO DIAL AND KNOB MOULDING MACHINE, Complete, Delivered, \$5.00

SPECIFICATIONS

This machine will completely make, graduate and number 20 dials and knobs per hour from Radio dielectric compound like Bakelite at a total cost of less than 18c per dial and knob. Furnished for either 3/16" or 3/8" shafts, 50 or 100 degree graduations, in 2 1/2, 3, 3 1/2 and 4 inch sizes like Tuska style with large tapered knob. A quantity of dielectric compound furnished with each mould gratis.

RAD-I-CO DIELECTRIC COMPOUND
ENOUGH FOR 6 DIALS AND KNOBS,
\$1.00 PER PACKAGE

RAD-I-CO VACUUM TUBE SOCKET
MOULDS (Base or Panel Mounting),
Complete, Delivered, \$5.00

(Rad-I-Co Moulded Sockets Cost Less Than 15c Each)

**RAD-I-CO VARIOMETER AND VARIO-
COUPLER ROTOR OR STATOR**
MOULDS, Complete, Delivered, \$5.00 Each
(REMLER OR TUSKA TYPE)

All items guaranteed to satisfy, immediate deliveries, full instructions, terms cash with order.

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YORK, PA.

(exclusive makers of Rad-I-Co
Patents Pending Products)

This Fall and Winter The BIG Thing will be RADIO!

Every radio expert—from Marconi down—who has analyzed the situation says that radio will take the predominant place over all other matters that may occupy the public mind. To keep thoroughly posted, subscribe for

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Subscribe direct or through your news-dealer. \$6.00 a year, \$3.00 six months, \$1.50 three months.

**AND YOU WILL RECEIVE RADIO
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New York

Superior Radio Products

All Parts, Receiving Sets Complete and in Units. Send for Description and Prices. Prompt Shipment on Mail Orders.

Dealers Write for Proposition

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Mfg. High Grade Radio Apparatus
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GUARANTEED RADIO SETS & ACCESSORIES

**NORTHERN RADIO SUPPLY
CO., Inc.**

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Mail orders promptly attended to

KNOCKED-DOWN VARIABLE CONDENSER

MONEY-SAVING PRICES

An accurately made, fully efficient instrument that cannot get out of order or adjustment. Fully guaranteed. Extra heavy aluminum plates. Condensite end pieces. All other parts heavily nickel-plated. Knob and pointer included. Furnished assembled or knocked-down at the following low prices. Easily assembled by anyone following instructions furnished. Save money—order from us. Folder upon request.

No. of Plates	M.F.D. Capacity	Assembled	Knocked-down
3	.00007	\$1.75	\$1.50
11	.00025	\$2.50	\$2.00
21	.0005	\$3.25	\$2.50
43	.001	\$5.50	\$2.50

Lott's Better Radio Condenser Co.
475 ORANGE STREET NEWARK, N. J.

Your Opportunity To Profit

because of the Tremendous Wave of Radio Enthusiasm now Sweeping over the World, is at hand.

"Sparks," a publication devoted to the outlook for the

Acme Battery and Radio Corporation

an established, growing concern, clearly outlines the Profit Possibilities of the company's shares.

Send for "Sparks" at Once.
There is no charge.

Industrial Expansion Service
No. 1674 Broadway New York

News May Be Radioed to Country Newspapers

ONE very practical use to which radio will probably be put shortly, says "The Globe," New York, is the dissemination of news among country newspapers. One of the most serious problems which many of the journals in the smaller towns have to face is the purchase of outside news by wire, which is frequently beyond their means, or to secure the same news through delayed channels, putting their readers many hours behind more fortunate sections of the population.

This difficulty could be readily overcome by the translation of the news bulletins by wire to central points all over the country, whence they could be broadcast over their respective areas and put into print almost simultaneously with the metropolitan journals.

News sent out in this way would, furthermore, not conflict with the ordinary broadcasts since they could be sent out on high wave lengths, and the bulk of it would undoubtedly travel during hours when the air is comparatively free, from 12 P. M. to 12 M.

The psychology of the reaction of a large body of people to public events is a subtle thing, and by no means completely understood as yet, but it is fairly certain that in so large a population as ours immediate access to the same news sources is highly desirable if public opinion is to be made free from sectional prejudice. Inadequate and delayed information has frequently been a harmful weapon in the hands of the demagogue.

Telegraph Supplements Radio in Army Net

PROBABLY for the first time since the advent of radio as a practical means of communication, line telegraphy is literally taking a back seat, aiding the Signal Corps Radio Communication Service only from main centers to its outlying stations.

To-day, when a message for an Army post or station is filed at the message center in Washington, it goes by radio and saves the Government money; but some of the smaller posts are not yet equipped with radio and, for that reason, messages for those points are relayed by line wires.

If for any reason a radio station is out of commission, or static interferes, the telegraph again takes up the communication and forwards it to its destination.

13 New Broadcasters

THIRTEEN limited commercial broadcasting stations were licensed during the week, July 17 to 22 inclusive. They are as follows:

- WIAB—Joslyn Automobile Co., Rockford, Ill.
- KFBC—W. K. Azbill, San Diego, Calif.
- WHAZ—Rensselaer Polytechnic Institute, Troy, N. Y.
- WIAK—The Stockman Journal, Omaha, Nebr.
- KFAU—Independent School District, Boise City, Idaho.
- WHAT—Yale Democrat, and Yale Telephone Co., Yale, Okla.
- KIFAT—Dr. S. T. Donohue, Eugene, Oregon.
- KDPM—Westinghouse Electric and Manufacturing Co., Cleveland.
- WIAJ—Fox River Valley Radio Supply Co., Neenah, Wisc.
- WIAI—Heers Stores Co., Springfield, Mo.
- WIAH—Continental Radio Manufacturing Co., Newton, Iowa.
- WHAY—Huntington Press, Huntington, Indiana.
- WHAX—Holyoke Street Railway Co., Holyoke, Mass.

AGENTS

Wanted in every city and town to sell radio apparatus. Good commissions. A few stocking agencies open to reliable parties.

DELANCEY, FELCH & COMPANY
13 Meeting St. Pawtucket, Rhode Island

VARIO TUNER

Especially wound for long Distance Radiofane Reception

Supersensitive Circuit

"Circuit Furnished with Each Order"

Price, \$5.00

Elizabethtown Radio Equipment Co.

Elizabethtown, Pa.

READ RADIO BOOKS

By JAMES R. CAMERON

HOW TO BUILD YOUR OWN RADIO SET \$.25

RADIO DIRECTORY..... .50

RADIO FOR BEGINNERS..... .1.00

Buy them to-day from your dealer or direct from

TECHNICAL BOOK COMPANY
130 WEST 42nd STREET NEW YORK

86,960 NAMES

Increase your sales by using names and addresses of firms and individuals interested in everything in Radio.

310 Radio Manufacturers in the U. S. \$2.00

650 Radio Supply Jobbers in the U. S. 5.00

6,500 Retail Radio Dealers in the U. S. \$5.00

5,000 Amateur and other owners radio apparatus..... 10.00

25,000 Amateur and other owners radio apparatus..... 40.00

50,000 Amateur and other owners radio apparatus..... 75.00

Amateur Radio Directory of the U. S. Complete

List of Amateur stations with names and addresses of operators or owners. Priced for \$3.00

Names and addresses are guaranteed 95% correct

will refund postage on all mail returned as undeliverable if less than 95%. Remit with order.

SUBSCRIPTION AGENCY

1921 Carrington St. Janesville, Wis.

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Have you our price list?
Drop us a line

Everything for radio

RADIO ACCESSORIES CO.

220 West 42nd Street, New York

NOVO "B" BATTERIES FOR RADIO

22½-45 & 105 VOLTS



**NOISELESS
DEPENDABLE
GUARANTEED**

ASK YOUR DEALER

NOVO MANUFACTURING CO.

424-438 W. 33rd ST.

531 SO. DEARBORN ST., CHICAGO.

No Aerial No Loop
No Lamp Socket Attachment

ONLY—

RADIO-DUCT

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**Sold in 10-Foot Rolls
At \$1.00 per Roll**

IF YOUR DEALER HAS NOT
GOT IT WE WILL SHIP
DIRECT UPON RECEIPT OF
YOUR REMITTANCE.

Columbia Electric Motor Co.

1414 ADAMS STREET

HOBOKEN NEW JERSEY

Telephone: 3731 Hoboken

Fifty-two issues for \$6.00. Sub. Department, Radio World, 1493 Broadway, N. Y. C.

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DEPARTMENT AT 5c A WORD

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This department is intended for everybody who wants quick action on short announcements covering the buying, selling, exchanging or general merchandising in the radio field. Readers of RADIO WORLD will find that it pays to read these columns every week. Advertisers will get a ten-day service here—that is, copy received for this department will appear in RADIO WORLD on the news-stands ten days after copy reaches us.

The rate for this RADIO WORLD QUICK-ACTION CLASSIFIED AD. DEPT. is 5c. per word (minimum of 10 words, including address), 10% discount for 4 consecutive insertions, 15% for 13 consecutive insertions (3 months). Changes will be made in standing classified advs., if copy is received at this office ten days before publication. RADIO WORLD CO., 1493 Broadway, N. Y. C. (Phone, Bryant 4796.)

Manufacturers of Rogers Radio Receivers and Rogers Receiving Radiometers. Rogers Radio Company, 5133 Woodworth Street, Pittsburgh, Pa.

PATENTS—Electrical cases a specialty. Pre-war charges. B. P. Fishburne, Registered Patent Lawyer, 386 McGill Bldg., Washington, D. C.

SALESMEN—To call on Radio Dealers. Splendid opportunity. Liberal commission. Write EDW. J. GOETZ CO., Distributors, Cambridge Bldg., Cincinnati, Ohio.

High Grade Antenna Wire. Best quality 7 strand No. 22, tinned copper, non-corrosive antenna wire. Only 1c. per foot. The Kehler Radio Laboratories, Dept. W., Abilene, Kans.

ATTENTION RADIO DEALERS and AMATEURS Why pay \$0.75 or \$1.00 for HEAD PHONE CORDS? Send us 40c. in coin and we will send you a finely braided complete HEAD PHONE CORD, Postpaid. All orders filled in turn. New England Braiding Co., Calendar St., Providence, R. I.

Exchange jolly interesting letters through our Club! Stamp appreciated. Betty Lee, 4254 Broadway, New York City.

ARMSTRONG SUPER-REGENERATIVE CIRCUITS. Wonderful results in R.F. amplification from only two tubes, instead of six or eight. These circuits will not work unless you know constants and all apparatus used. Complete tested diagrams containing all hitherto unpublished constants and full instructions for fifty cents. R. I. Co., Red Bank, N. J.

TESTED Galena crystals, 25c.; Phone Condensers, .001 MFD, 17c.; Grid Leak and Grid Condensers, .0005 MFD, 25c. BUSCH-MURPHY, 105 Mason St., Rochester, N. Y.

CRYSTAL DETECTOR SET, from aerial to phones, complete. Big bargain. Send for circular. Salkey Radio Co., 2378 Eighth Ave., New York City.

LOOK—Single Tube Receiver, mounted on panel, ready to wire, \$18. J. N. RISTEY, Spring Grove, Minn.

FOR SALE—Immediate Delivery! 750 Sheets Aluminum, size 0.24-11-72. LOGAN MACHINE CO., 222 S. Clinton St., Chicago, Ill.

SPECIAL—High Grade Variometers, \$4.65 and \$5.20; Variocouplers, \$4.65 and \$4.95; Composition Dials, 75c.; Headphones, \$4.90; Rheostats, \$1.18; Switch Levers, 45c and 60c.; Switch Points, 3c.; Binding Posts, 6c and 9c.; Condensers, 11 Plate, \$2.85, 23 Plate, \$3.80; Bakelite Sockets, 72c.; Best Composition Insulators, 22c.; Lightning Arresters, \$3. Include postage with order. J. N. RISTEY, Spring Grove, Minn.

AMATEURS, ATTENTION! USED APPARATUS—Audion, complete with bulb and battery, \$10.00; Adams Morgan Variable Condenser, wood case, \$2.50; Murdock Variable Condenser, .001 mfd., \$3.00; Arnold Loose-Coupler, \$10.00; Short Wave Receiver, 200 to 800 meters, fitted for audion bulb, etc., \$15.00; Klitzten Rotary Gap, \$15.00; Half K. W. Packard Transformer, unmounted, \$10.00; Holtzer-Cabot Headset, 2,200 ohm. (new), \$6.00; Swedish-American Headset, 2,200 ohm. (new), \$6.00; 2-inch Spark Coil, \$5.00; Stationary Gap, 50c.; Regenerative Tuner, consisting of two variometers and vario-coupler, mounted on handsome brown hard rubber panel in walnut finished case, hand rubbed. This tuner is a beauty in appearance and performance. \$25.00. First money order takes them. Do not delay! L. M. SMITH, Box 66, Salem, Wis.

43 PLATE CONDENSERS, \$3.95; Rheostats, 95c.; 7-Strand No. 22 Tinned Antenna Wire, 90c per 100 ft.; Manhattan Head Phones, \$6.00; Tested Galena, 20c, mounted, 30c.; Contact Points, 30c per dozen; Complete Crystal Sets, with Aerial Equipment and Manhattan Head Phones, \$12.50. Postage paid to second zone. Write for prices on parts not listed. COLUMBIA RADIO COMPANY, P. O. Box 1720, Washington, D. C.

RADIOISTS—Send for literature describing Vosco Tunette. Compact, simple, efficient tuner for radiophone reception. Broadcasts heard hundreds of miles. Panel or table mounting. Price, \$5.00. VOSCO RADIO LABORATORIES, Troy, Penna.

AUGUST SPECIAL
AUDION RECEIVERS, regular price, \$32.50, reduced to \$25.00 for short time. Wave Length, 200 to 800 meters, Variable Condenser, two Ten Point Switches, Socket, Dials, etc. Mounted on Mahogany Panel in 8 x 9 x 6 Mahogany Finished Cabinet. Shipped prepaid upon receipt of money order. Every set guaranteed. Stamp for descriptive circular. GIBSON & COLLINS, 515 Evergreen Avenue, Brooklyn, N. Y.

SALE OR EXCHANGE—New Clapp-Eastham Loose Coupler. Retail \$14.00. Best offer gets it. FRANKLIN CAMPBELL, El. Wakefield, N. H.

TWIN S CRYSTALS—The Super-Sensitive Crystal. Sold with a money back guarantee. Pair, 25c. 500-mile Regenerative Plan Free. NELSON MFG. CO., Interurban Bldg., Dallas, Texas.

RADIO ONE-STAGE RECEIVER—Not wired, 6/21 Cabinet and Formica Panel with holes drilled. Only \$29.50. You save half. MIDWEST RADIO CO., 1110 Washington, St. Louis.

PRICES SLASHED on Standard Headsets and Supplies. Radiotron Detectors, \$4.48; Amplifiers, \$5.88. Variable Condensers, 23-Plate, \$1.75; 43, \$2.35. Transformers, \$3.75. State wants. Stamp Please. WAGNER NOVELTY CO., Delphos, O.

EXTRA SELECT GALENA CRYSTALS—Two ounces for fifty cents. Enough to make fifteen crystals. Direct from Kentucky mines. Order today from CASSADY & CASSADY, Marion, Ky. Dealers, write!

WANTED—Men over 17. \$135-\$195 month. Railway Mail Clerks. List positions free. FRANKLIN INSTITUTE, Dept. H-151, Rochester, N. Y.

REGENERATIVE RECEIVER, \$25.00. JOHN HAMMOCK, 3743½ Nicollet Avenue, Minneapolis, Minn.

BUILD A 500-MILE REGENERATIVE RECEIVER FOR \$15.00. Plans 10c with catalogue of Radio parts. NELSON MFG. CO., Interurban Bldg., Dallas, Texas.

PUT PEP INTO YOUR RECEIVING SET with my Newtype Fixed Condenser. Used by 10,000 amateurs in Detroit. Price, in wood container, 35 cents. Taped only, 20 cents. Big discount to jobbers and dealers. KORREK RADIO CONDENSER CO., 3389 Warren Avenue, East Detroit, Mich.

A BROADCASTING MAP of the leading broadcasting stations of the country was published on the center page of RADIO WORLD dated May 20. Mailed on receipt of 15c., or send \$3.00 for six months, or \$6.00 for a year, and start your subscription with May 20 issue. RADIO WORLD, 1493 Broadway, New York City.

Functions of Reception
MOST radio enthusiasts know that there are various types of apparatus for the reception of radio broadcasting. Some of these sets are more sensitive than others. Sensitivity, in the sense we apply it to

receiving sets, is a quality analogous to power in transmitting apparatus. Most receiving sets have five distinct functions: intercepting, detecting, tuning, amplifying and reproducing. It will be helpful to us later when we consider receiving sets as complete units, if these functions are understood.

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"Quality Radio Priced Right"

3 Plate Variable Condensers.....	\$1.50
Mirad Variocouplers	3.75
3000 Ohm Double Head Phones.....	6.00
1500 Ohm Single Head Phone.....	3.00
(Money back guarantee.)	
Mirad Detector Unit.....	30.00
Mirad Two-Step Amplifier.....	25.00

Postage Paid
Dealers' Sample of Above 25% Off

Miracle Radio Mfg. Co.

Interurban Bldg., Dallas, Texas

Radio Set Complete

Enjoy Daily Concerts, Weather Crop
and Sporting News

Complete Outfit \$12.75
Including 2,000-ohm Phones
Immediate Shipment.

Can be installed in 30 minutes
by any one.

Full instructions with each set.
Send check or money order to

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Selling Agents Wanted.

Double Radio Service for New Apartment House

A CHOICE of "listening in" to either of two programs being sent out by the big broadcasting stations will be a feature of a unique radio-system being installed in a seventy-two-family apartment house in Newark, New Jersey, by the Davis Electric Company. Two complete receiving sets will be installed, each with a large loop, or directional aerial.

A special radio-room in charge of a licensed operator will house the equipment. From this room will emanate two complete circuits connected to each of the seventy-two apartments and so arranged that the tenant may plug in his receiving set to whichever of two programs he may prefer. The apartment operator will tune in each evening to the two stations that offers the best programs or are heard the clearest. In this way, the tenants will be able to enjoy the best in the ether each night with the least trouble.

Two complete G-E receiving sets, of the type furnished by the Radio Corporation of America, each equipped with a detector tube, two stages of audio and two steps of radio frequency, will be installed.

A Vote for Phonograph Dealers

EDITOR, RADIO WORLD: In reference to your "Service Will Decide" question, page 22, RADIO WORLD, No. 116, dated July 15, I would certainly second the motion of the editorial in "The Evening Mail," in regard to phonograph dealers handling the bulk of the radio business in the near future. First of all, as young as the radio game is, you will notice that some of the high-class sets have, to all outward appearances, a phonographic appearance in regard to case, etc. It is only a question of time when most every radio will be twin to a phonograph.

Phonograph on one side and radio outfit on the other—or an upright machine some space that is now used for records. There is no question that radio and the phone yet go hand in hand.—JACK COGGIN, Brooklyn, N. Y.

Coming Events

The editors of RADIO WORLD will gladly publish news items of all contemplated radio shows and expositions. Keep us posted by mailing full information.

ANNUAL SHOW OF THE ST. LOUIS RADIO ASSOCIATION, St. Louis, Mo., October 4 to 7, inclusive.

CHICAGO RADIO SHOW, Colliseum, Chicago, Ill., October 4 to 22. U. J. Hermann, managing director, 549 McCormick Building.

INTERNATIONAL RADIO EXPOSITION, Grand Central Palace, New York, December 21 to 30.

KANSAS RADIO EXPOSITION will be held at the Kansas State Fair, Hutchinson, Kansas, September 16 to 22 inclusive. A. L. Sponsler, secretary.

MERCHANTS' COOPERATIVE ADVERTISING AGENCY RADIO SHOW, Robert Treat Hotel, Newark, N. J., October 4 to 7, inclusive.

"RADIO DAY," Pittsburgh, Westview Park, August 24. Under auspices of Radio Engineering Society. C. E. Urban, secretary.

RADIO CLUB OF AMERICA. First autumn meeting will be held the last Friday in September. Renville H. McCann, secretary, Columbia University, New York.

CLEVELAND RADIO AND ELECTRICAL EXPOSITION, Cleveland Public Auditorium, Cleveland, O., August 28 to September 4, inclusive.

CINCINNATI RADIO-AND-ELECTRICAL EXPOSITION, Music Hall, Cincinnati, O., October 2 to 7, inclusive.

Subscribe direct or through your news dealer. \$6.00 a year, \$3.00 six months, \$1.50 three months. Radio World, 1493 Broadway, N. Y. C.

NEXT WEEK'S ISSUE OF RADIO WORLD

No. 28, Dated August 12, 1922, contains a new article by George W. May, R.E., on AUDIO-FREQUENCY TRANSFORMERS Very Important! Don't Miss It!

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Compact, Interchangeable, Highly Finished. All Sizes, 3 Plate, \$2.00; 43 Plate, \$4.00. Template for Mounting

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Manufacturers of Tools, Dies, Precision Instruments

Learn to Receive Code Messages Standard Regulation U. S. Army

Field Message Book

Purchased from Signal Corps, U. S. A. Pocket Size: 4 1/4 x 6 1/4, Cloth Bound, Hard Board Cover. 104 Pages.

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MORSE CODE SEMAPHORE CODE INTERNATIONAL CODE

Carbons and Blanks for receiving, etc.

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cannot be accomplished without certain fixed inductance values. We have for immediate delivery:

5 M. H. Choke Coils . \$2.50

100 M. H. Choke Coils . \$2.50

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The above parts have been tested in our Demonstrating Set, using the

ARMSTRONG CIRCUIT

and are known to be of correct value.

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Radio Engineers

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DICTOGRAPH HEADSET \$9.00

3000 ohms \$12 value

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CENTRAL-KANSAS
RADIO WHOLESALE CO.

LYONS, KANSAS

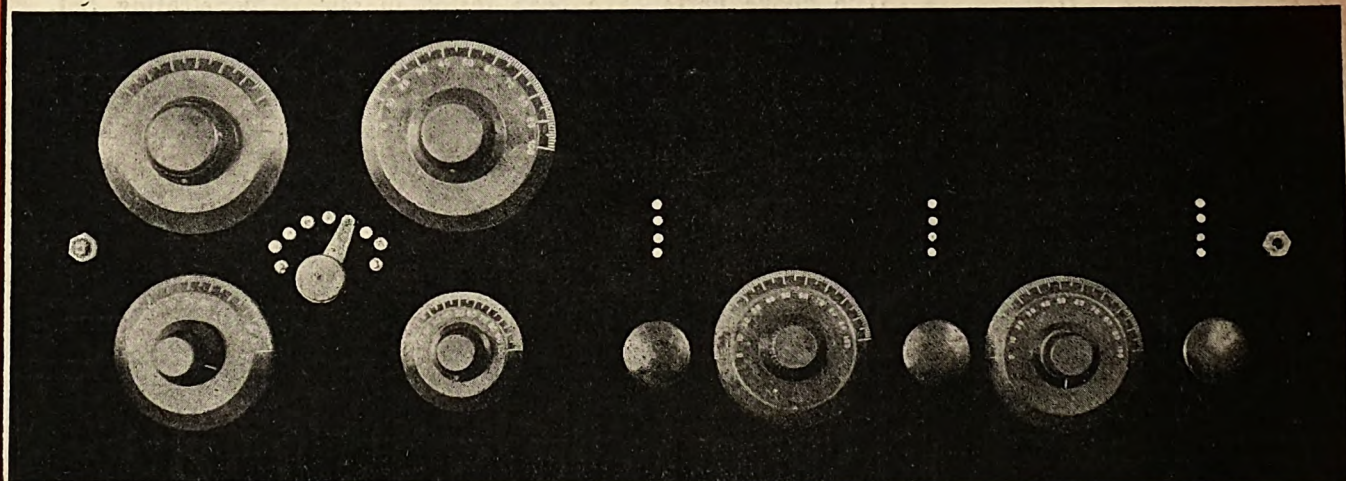
SUPER-REGENERATION

What It Is and How to Control It

CONSTRUCTION OF SUPER-REGENERATIVE RECEIVERS

The only authentic booklet with 12 diagrams and photos of two different sets actually constructed by the author. Both in one booklet by Kenneth Harkness.

Price 50 Cents



Front view of the second set constructed. This receiver employs three tubes and gives very high amplification.

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All parts, for three tube set, including Bakelite panel, necessary for assembling the above, packed in a neat box with complete and detailed instructions.

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Manufacturers of the "Vox Humana," the Receiver with the Living Voice

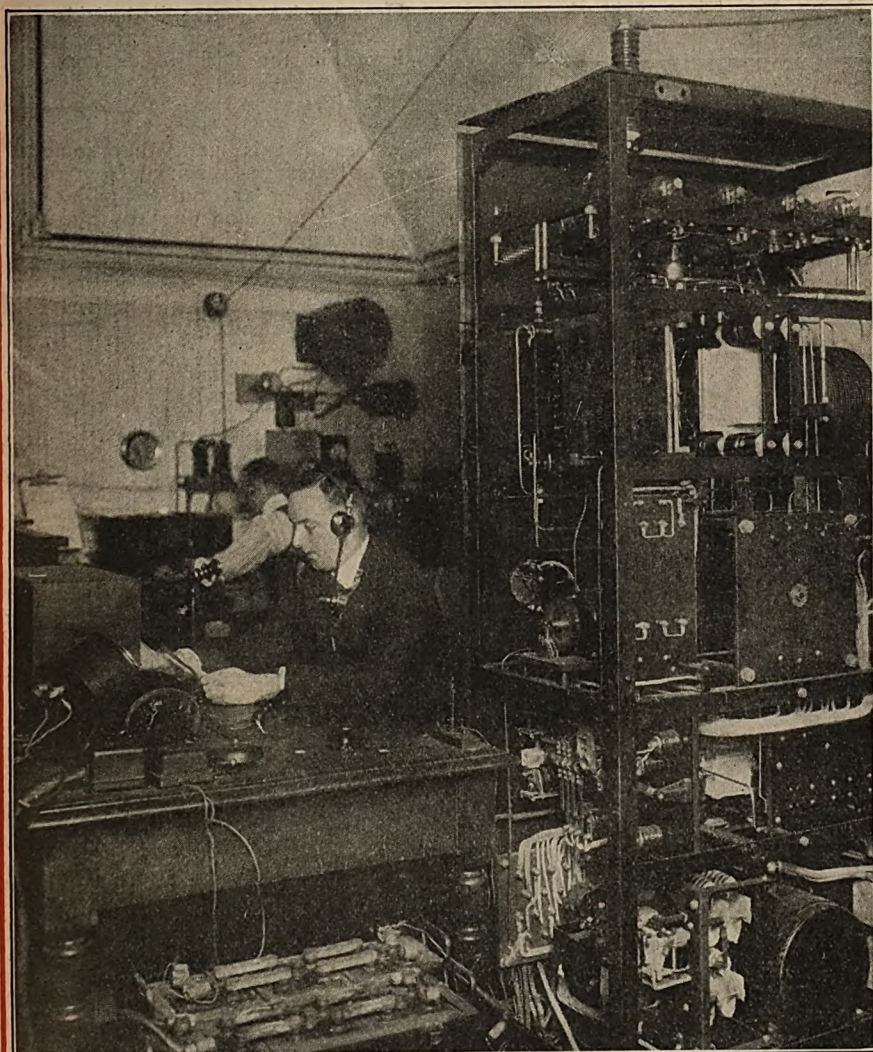
Specialists in Radio Frequency Amplification

256 West 34th Street, New York City

RADIO WORLD

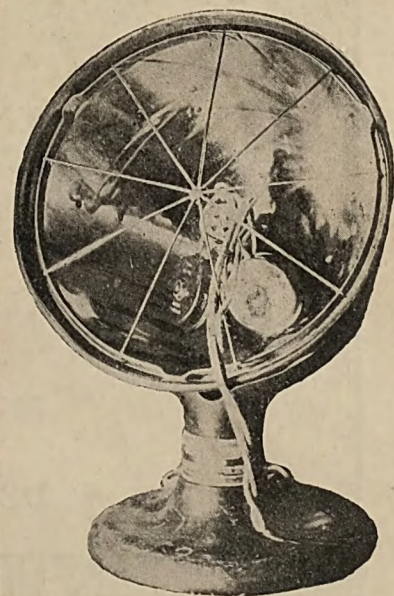
Entered as second-class matter, March 28, 1922, at the post office at New York City, New York, under the act of March 3, 1879.

I L L U S T R A T E D



(C. Harris & Ewing, Washington, D. C.)

Radio Broadcasting Room of the United States Post Office (See page 11)



How to Convert an
Electric Heater
Into a
Loud Speaker

(See page 8)

HOMCHARGE YOUR BATTERY for A Nickel

No muss, trouble, dirt—no moving of batteries—loss of time—no effort on your part—no technical or professional knowledge needed.

THE HOMCHARGER

successfully meets all charging conditions, and is the only rectifier combining the following essential Homocharging features:

1. Self-polarizing. Connect battery either way and it will always charge. No danger of reverse charging, ruined battery or burnt-out rectifier.
2. No delicate bulbs to break or burn out. Only one moving and two wearing parts. These are replaceable as a unit, after thousands of hours' use, at small cost. Cannot be injured by rough handling.
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4. The only charger costing less than \$100.00 that will fully charge a battery over night. Gives your battery a taper charge—exactly as recommended by battery manufacturers. Guaranteed not to harm your battery, even though left connected indefinitely.
5. Highest efficiency of any three or six cell charger made.
6. No danger of fire. Approved by the Underwriters.

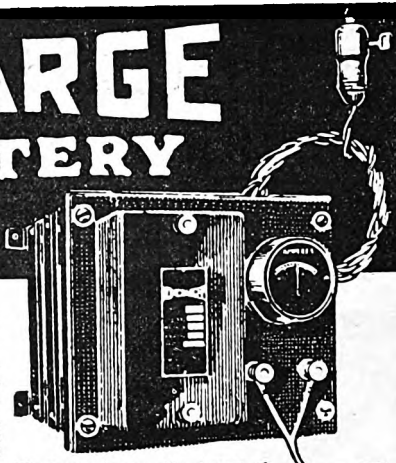
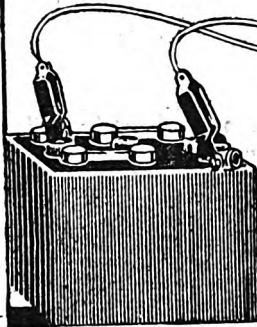
ATTENTION MOTORISTS

Will charge your auto battery as well as radio battery. Send for Bulletin No. 58 for further information.

For sale by all radio, electrical and accessory dealers or shipped, express prepaid, for purchase price \$20 West of the Rockies

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135 West Third St. CINCINNATI, OHIO
BRANCH OFFICES—New York, Chicago, Pittsburgh,
Los Angeles, New Orleans, Detroit, Toronto, Philadelphia, Baltimore, Dallas.



The Radio "Colyum"

THE courts have decided that "marriage by radio" is a perfectly legal process. Mary Glynn, a British "movie" actress has decided to try the radiant route to matrimony. The radio divorce mill, however, is very much in the formative state.

Man in Missouri objected when village constabule asked him to open his battery case thinking the contrivance contained anti-Volstead liquid. "Show me!" is still the dominant motto out there.

The old Poulson arc is finding its way to the discard in favor of the "peanut" tube. Alcohol is necessary to the life of the Poulson arc. It just has to perish.

IN RETROSPECT

There were things that my grandmother never could do—

Pray, child, pray.
Dress like a flapper and make home brew—

Say, child, say.
Take in the cheer of a loud-speaker clear,

Chat about static and strays,
Lightning arrestors and bulbs and detectors—

Think what she missed in her days!
There were things that my grandfather never could do—

Pray, child, pray.
Ride in a motor-car built just for two—
Say, child, say.

Hear a prize fight at his bedside o' night.
Knew not cycle or circuit or core;
Lived in the dark in re coupling and spark—

His life must have been one long bore!
Complaint is made that some of the radio messages received from mid-ocean this summer are unintelligible. But, of course, it is not due to the fact that senders are "half seas over."—Pittsburgh "Chronical Telegraph."

"Farmer up our way," writes J. D. Hawes, Ogdensburg, New York, "has named his pet cow 'Battery B.' Why? Discovered when milking her that her tail is full of switches."

Logan Hemstreet, Muncie, Indiana, sends this society note: "Mr. Reo Statt was host at a party in honor of his fiancée, Miss Milly Henry."

Suppose a large number of guests were invited to meter.

Our Own Broadcasting Station

OUCH for week beginning August 14, 1922.

7:01—Old Uncle Ebs' "Tales of the Pre-Cabaret Days," when he was a Night-Blooming Harold along the Great White Way.

7:23—Summer sports: Hunting Eggs in a Cuckoo Clock.

7:54—Reading: "Why Is an Ectoplasm?" by Professor Smudge of the Lapland University.

8:07—"The Flapper Curse and How to Cure It." A solo-symposium by Roy K. Moulton, cachinnatory expert of "The Evening Mail."

8:22—Deep-sea pastimes: "Dodging Rum Runners off the Atlantic Coast."

8:40—American Citizens Being Taxed to Support the Anti-Saloon League. Don't miss the peals of laughter that tune in with this number.

9:15—The latest dance craze: "Congressional Sidestepping."

9:30—Weather report: If it doesn't stop raining on Saturday afternoon, I'm going to take Sundays off.

10:00—Correct time from the Jupiter Pluvius Umbrella Factory.

—ROBERT MACKAY.

SPECIAL INTRODUCTORY

BARGAIN

DICTOGRAPH HEADSET \$9.00

3000 ohms \$12 value

DEALERS WRITE

CENTRAL-KANSAS RADIO WHOLESALE CO.

LYONS, KANSAS

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Subscribe direct or through your news dealer. \$6.00 a year, \$3.00 six months, \$1.50 three months. Radio World, 1493 Broadway, N. Y. C.

RADIO WORLD

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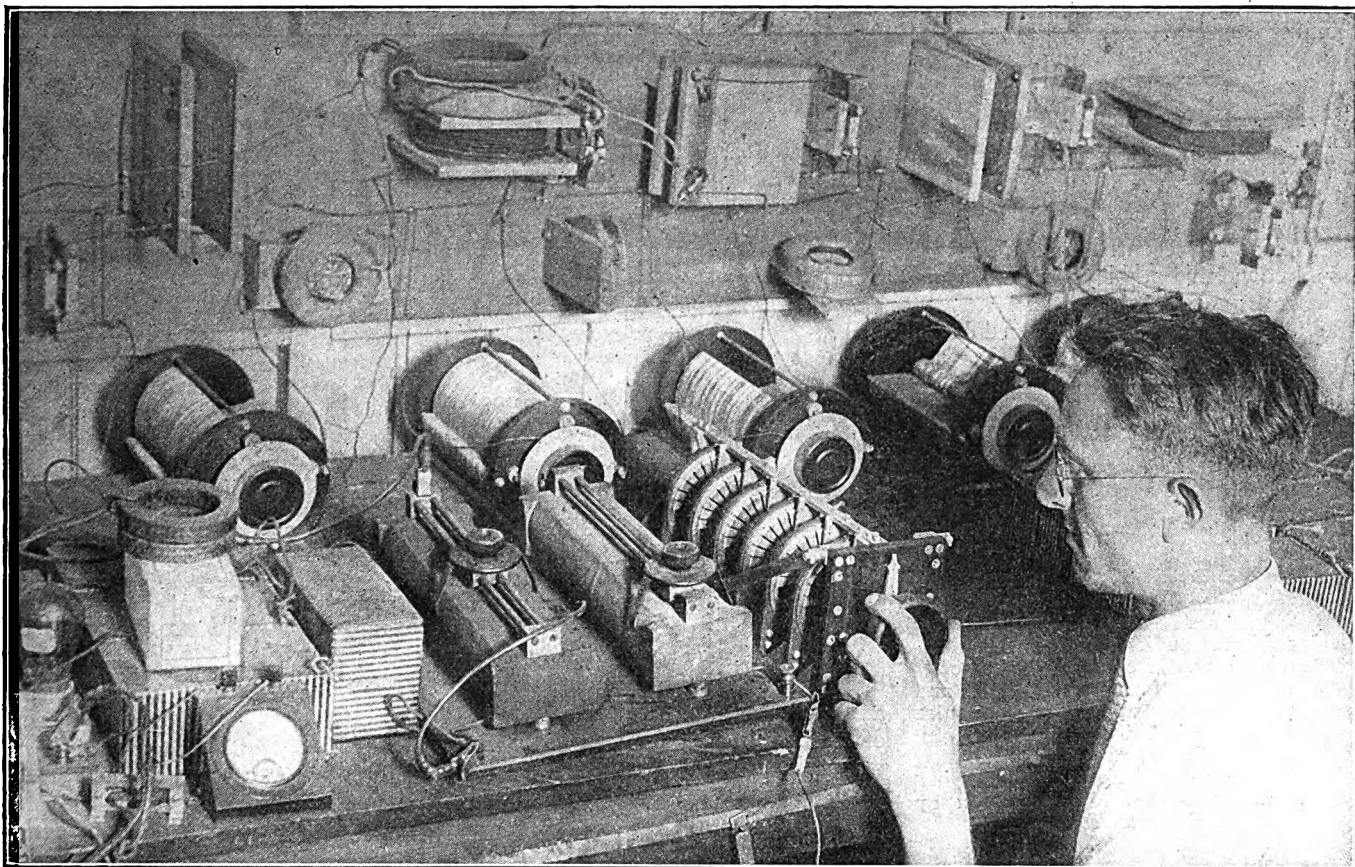
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Vol. 1, No. 20

August 12, 1922

15c. per copy, \$6.00 a year

High-Frequency Circuit for Receiving Transoceanic Messages



(C. Kadel & Herbert News Photos.)

The accompanying photograph shows A. Ringel, at the College of the City of New York, adjusting an instrument which tunes six circuits at one time. It is the new high frequency circuit used in receiving transoceanic radiotelegraph messages. When receiving more than 100 words a minute, by machinery, it is absolutely necessary to use a circuit of this type. Note the variable condensers on the back of the table. Above them are coils, placed at various angles. With the proper circuit it is possible to tune six circuits at one time.

451 Stated Broadcasters Wyoming Only Commonwealth in Union Now Without a Station

WHEN KDKA, the first broadcasting call, was assigned, nine months ago, to the Westinghouse Electric & Manufacturing Co., Pittsburgh, Pennsylvania, even the Chief Radio Inspector did not suspect that, to-day, there would be 451 stations broadcasting, one or more in every State except Wyoming. The growth has been phenomenal; but, at the same time, healthy, for applications for broadcasting-station licenses continue to pour in to the Department of Commerce at the rate of about three a day, with only about half a dozen withdrawals.

During the week ending July 29, twenty-six more stations were licensed, including the stations of the Wilmington Electrical Spe-

cialty Co., the first in the State of Delaware, which now leaves but one State without a broadcasting station.

Wyoming, last of the States alphabetically, is also the last to take up radio communication. There are no public service or broadcasting stations there, no experimental or technical operators and only three special or advanced amateur stations; one each at Douglass, Casper, and Elk. In the whole of the Seventh Radio District, comprising Wyoming, Oregon, Washington, Idaho, Montana, Alaska, there are only about 750 amateurs transmitting, while in other districts the number runs into two or three thousand. Evidently something must be done to awaken Wyoming to the call of the air, when even so small a State, Delaware, has one broadcaster.

Naturally the greatest number of broadcasting stations are operated by electrical manufacturers and dealers, but one of the keenest interests displayed is that of the press of America—68 papers broadcast.

May Have Talking Movies Illinois Professor Uses Loud Speaker and Amplification in New Invention

USING amplification and a loud speaker, Professor Tykocinski Tykociner, an instructor in the experimental station at the University of Illinois, believes that he has the solution of the talking movie. He produces a negative with the photographed subject on one side and the sound wave on the other, thus eliminating the ordinary problem of synchronization. When the light is thrown through this film on the wave side and concentrated on a photo-electric cell an electric current, varying with the volume of light is set up. The current is amplified many times and run through a loud speaking phone; it offers a curious field for experiment, inasmuch as there seems to be no reason for its failure.

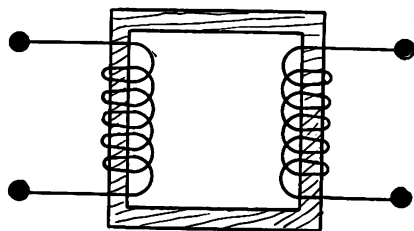
The Work of the Audio-Frequency Transformer

By George W. May, R. E.

WHAT is an audio-frequency transformer? Where is it used? What does it consist of? To the beginner these questions need explanatory answers. The audio-frequency transformer is a very important factor in radio reception.

Some experts credit these audio-frequency transformers as rectifiers, claiming that they rectify, or change, direct current to alternating current or vice-versa. Transformers are generally built in two ways, namely: to change an alternating current from a lower to a higher current; or, from a higher to a lower current.

A good illustration of just what takes place is presented by the bicycle. One knows that a bicycle has pedals which are so constructed so as to enable transmission from the pedals to



A closed-core audio-frequency amplifying transformer. It consists of two coils of insulating wire, forming a primary and secondary, wound upon a rectangular core. The core is built of sheets of iron, called laminations, to reduce the heating and increase the efficiency of the machine. Suggested by G. W. May. Drawn by S. Newman & Co.

the gear attached to the frame. It may be seen that the turning of the pedals rotates the gear in such a manner that if another gear should be coupled up by chain or belt, transmission could be had from one to another. Suppose we have a 5-inch gear on the pedal mount so that when the pedals turned, the 5-inch gear would rotate. On the rear wheel we have a 2-inch gear which, also, could be rotated. Now, if these gears were coupled by chain, or belt, and the pedals were made to rotate, we would have transmission of speeds. That is, every time the 5-inch pedal made one revolution, the 2-inch pedal would make, approximately, $2\frac{1}{2}$ revolutions. This would be a ration of 1 to $2\frac{1}{2}$, or vice versa. In fact, we would be creating transmission from a lower speed to a higher speed, or vice versa.

This illustration pertains to audio-frequency transformers. A transform-

er generally consists of a closed core made up of soft-iron laminations on which is wound two distinct coils, namely: primary and secondary. Their relation to the number of turns in both coils determines the effect of one coil upon the other. Let us assume that the primary coil is wound with 100 turns, and the secondary coil with 1000 turns or ten times the number of turns in the primary. We then exert a pressure of ten volts on the primary with a current strength of 5 amperes.

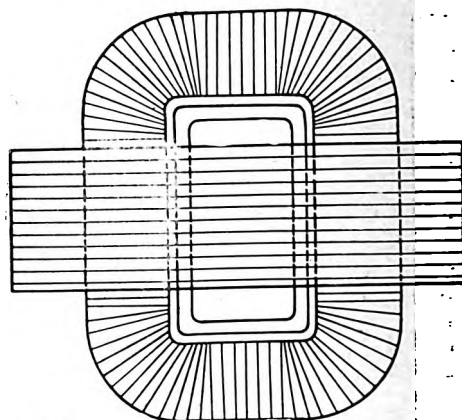
If the transformer is 100 per cent efficient, we could expect a current of .5 of an ampere at a pressure of 1000 volts in the secondary. When the number of turns on the secondary of a transformer is greater than the number on the primary, the voltage will be increased and, at the same time, the amperage lowered. When the secondary turns are less, this action is reversed.

Electrical transformers are subjected to losses, one form being copper losses occasioned by the resistance of the wire; and core losses which result from the inability of the molecules of iron to exactly follow the rapid alternations of the current to which a transformer is subjected.

The audio-frequency transformer illustrated is of the shell type utilizing a 14-mil., silicon steel core. The most effective function of the transformer is when its characteristics are diametrically opposite to good practice in ra-

dio resonance-design. If we have a low-coil resistance and comparatively high leakage tuned to a definite audio-frequency, we may then say that we have an efficient resonant-transformer. On the other hand, the amplifier transformer works at its best when the tables are turned or when the transformer has low leakage, tuning aperiodic, and the coils high resistance.

A simple way of making an open-



The completed core-transformer closed. When the transformer is completed, some method must be taken to prevent the wires from becoming injured. Tape is usually bound around these windings, as shown in the illustration. Suggested by G. W. May. Drawn by S. Newman & Co.

core type transformer audio-frequency, is to get a fiber, or cardboard, cylinder 1 inch in diameter and $2\frac{1}{2}$ inches long. On this cylinder place evenly spaced, 9 fiber washers with an outside diameter of $2\frac{3}{4}$ inches, and of an inch thick.

In each of these sections 1, 2, 4, 5, 7 and 8 wind a secondary winding of 1,000 feet No. 4 enameled copper-wire. In each section of 3 and 6, wind a primary winding of 1500 feet of No. 40 enameled copper-wire. Connect all primary windings in series with one another, also all secondary windings in series with one another. The binding posts may be connected and brought, as desired.

Transformers are generally used in receiving work in connection with vacuum-tube amplifiers. They do not act as amplifiers themselves, but merely step up the voltage of the plate circuit of the preceding tube. As a vacuum tube is a sort of valve, this increased grid current controls a relatively larger voltage and current in the amplifier plate-circuit. This is an important factor in radio work.

Functions of Reception

MOST radio enthusiasts know that there are various types of apparatus for the reception of radio broadcasting. Some of these sets are more sensitive than others. Sensitivity, in the sense we apply it to receiving sets, is a quality analogous to power in transmitting apparatus. Most receiving sets have five distinct functions: intercepting, detecting, tuning, amplifying and reproducing. It will be helpful to us later when we consider receiving sets as complete units, if these functions are understood.

Radio activity and public service will be harnessed. This will mean another step higher in civilization.—Hoover.

Early Days in Radiophone Broadcasting

Historic Dates in the Annals of the New Era of Radio News and Music

By Charles Gilbert

President and General Manager of the De Forest Radio Telephone & Telegraph Co.

SO much interest is being shown in the beginnings of radio broadcasting, in the present awakening of public interest in the radio art, and so many inquiries are being made regarding the pioneer broadcasting of Dr. Lee de Forest that a few of the historic dates in the development of this notably American art will be interesting to the growing population of radio fans.

The first broadcasting of music was not by means of the phonograph so generally used at present. The spring of 1907 saw the radio distribution of synthetic electrical music, generated and played in a building at the corner of Broadway and 37th Street, New York City. The plant itself consisted of many inductor alternators whose frequencies were those of the entire musical scale. Music furnished by this electrical organ was transmitted by wire to nearby theaters, hotels, and restaurants, where one or several horns, or loud-speakers poured into the ear this new electrical music. To connect this musical current into radio frequency and impress on the antenna—erected for this purpose on the roof of this building by Dr.

de Forest—was comparatively simple; and, thereupon, the demonstrations were made for the receiving stations in New York City. This experiment in broadcasting, however, lasted but a very short time.

The location of what may properly be described as the first actual radiophone broadcasting station of the world, however, was in the old Parker Building, 19th Street and Fourth Avenue, New York City. On the top floor of this building was the laboratory of Dr. Lee de Forest; two flag poles on the roof of this building furnished the necessary support for the antenna. It was in this same little old laboratory that, many months earlier, the inventor tested out his first three-electrode vacuum tube. Unfortunately, this historic laboratory, which saw the birth of the "tiny glass baby," known as the modern Aladdin's lamp, is no longer in existence. In January, 1908, a great fire completely destroyed the Parker Building, incidentally wiping out of existence notebooks and many precious samples of the earliest audion bulbs.

The first actual transmission of phonograph music was the result of

experimental tests by Dr. Lee de Forest, in 1907, on some twenty small telephone transmitters planned for installation on the late Admiral Evans's battleships and destroyers, prior to their historic round-the-world cruise.

The first actual application of the de Forest radiophone in reporting a news event was, no doubt, the reporting of the yacht races on the Great Lakes in the same summer of 1907; gramophone music was then furnished between the spoken bulletins.

During the operatic season of 1908-09, there was a temporary installation of a radiophone broadcasting station on the roof of the Metropolitan Opera House, New York City. Microphones concealed among the footlights of the stage, connected with the transmitting station, then gave the first radio opera in the history of the art.

The first opera artist to sing directly into the microphone of a de Forest radiophone transmitter was Madame Mazarin, Oscar Hammerstein's dramatic soprano, who sang at a special performance at the de Forest laboratory at 103 Park Avenue, New York City.

Radio news and music was first furnished on a regular program, in the fall of 1916, at the de Forest laboratory in Highbridge, New York. In connection with "The New York American," the election returns of the 1916 campaign were supplied to the radio amateurs of the Eastern States. Music for a radio dance was supplied by the de Forest Highbridge laboratories, on the evening of December 30, 1916, for a house party given in Morristown, New Jersey.

After several experimental tests, "The Detroit News," on Wednesday September 1, 1920, reported the fact that the Detroit News Wireless Service "for the benefit of the Detroit devotees of the radiophone will be a regular part of the news to the public."

It should not be forgotten that the year 1920 also saw the broadcasting of orchestral music on a large scale from the California Theater, San Francisco.

Hope to Radio Jazz to Death



(C. Kadel & Herbert News Service.)

Famous Dallas Choir of the Sacred Harp Singers representing 4,000,000 members, mostly from Southern States, recording old-time hymns to be broadcast to future generations. The Texans say that jazz does not appeal to the best that's in us. The photograph shows the Dallas choir. In the group are Mrs. C. A. Penniman, W. T. Coston, J. Roscoe Golden, T. K. Johnston, Lindsay M. Greene, Mrs. L. C. Bridges (director), E. W. Macon, A. A. Heartsill, and Harry J. Thomas.

New Chamber of Commerce to Make Radio a Public Utility

By Carl Hawes Butman

GOVERNMENT officials having to do with radio communication, including Herbert R. Hoover, Secretary of Commerce, who is charged with its regulation, believe that if the newly-organized Chamber of Commerce lives up to its plans and aims, the future of radio in this country is assured.

Based on sound principles of guaranteeing to the users of radio, and the public in general, standard and efficient radio sets and better broadcasting, and aiming to make radio a public utility, pioneer manufacturers have organized the first Radio Chamber of Commerce. Their first convention, held in Washington, D. C., was a huge success. It was a representative meeting, there being over thirty radio manufacturing firms, from all parts of the country in attendance, said to represent over 80 per cent. of the manufacturers. The possibility of "clique or sectional" control was eliminated by the constitution and by-laws adopted. The election of a board of governors, including eleven district vice-presidents, each of whom has a vote, guaranteed that each of the nine radio districts would have at least one representative on the governing board.

At the opening of the three-day session at the Wardman Park Hotel, Judge W. H. Davis, of New York, was made temporary chairman. In the absence of the Secretary of Commerce, detained by coal conferences, the chairman presented a message from Secretary Hoover approving of the formation of the national chamber, and carrying a promise of co-operation if the plans of the chamber to "maintain a high standard of quality and dependability in the manufacturing of radio apparatus" and to protect the public from inferior sets made by manufacturers who do not have the welfare of the industry under consideration, are carried out.

A committee of fifteen manufacturers nominated representatives of the radio industry for officers and directors, and the election resulted in the selection of the following temporary officers to serve until the first regular election set for November:

W. H. Davis, of Pennie, Davis, Marvin & Edmonds, New York, president; Harold J. Power, American Radio and Research Corporation; Medford Hillside, Massachusetts, vice-president; George Lewis, National Radio Chamber of Commerce, New York, executive secretary; Cloyd

Marshall, Dubilier Condenser Company, New York, treasurer.

Eight governors and one alternate were also elected: A. H. Grebe, A. H. Grebe & Co.; C. B. Cooper, Ship Owners Radio Service; A. G. Morgan, Adams & Morgan B. L. Moore, Federal T. & T. Co.; C. R. Rypinsky, C. Brandies Co.; C. E. Stahl, Connecticut Tel. & El. Co.; J. R. Crawford, National Carbon Co.; E. F. Harding, Holtzer Cabot Co.; and F. Washington, Cutting & Washington.

The following vice-presidents were also elected for seven radio districts, two remaining to be elected later: First—O. K. Luscomb, Clapp-Eastham Co. Second—A. M. Joralemon, National Carbon Co. Third—A. Keny, Atwater-Kent Co. Sixth—A. B. Kennedy, Colin B. Kennedy Co. Seventh—R. H. Mariott, United States Government. Eighth—Powell Crosley, Jr., R. B. Conrad, Westinghouse El. Mfg. Co. Ninth—Harry Bradley, Allen Bradley & Co., and Dr. Burgess, Burgess Battery Co.

Besides the officers mentioned above, the following took active interest in the outcome of the first convention:

Major L. B. Bender, Army Signal Corps; Harry L. Bradley, Allen Bradley Co., Milwaukee; Dr. L. Clement, Philadelphia; W. L. T. Davis, Eastern Radio Corporation, Wilkes-Barre, Pa.; Dr. J. H. Dellinger, Bureau of Standards; A. A. Dana, Fahnestock Electric Co., Long Island, N. Y.; William Dubilier and W. A. Eaton, Dubilier Condenser Co., New York; Alex Eise-mann and J. D. R. Freed, Freed-Eise-mann Radio Corporation, New York; Matthew Q. Glaser, New York; F. P. Guthrie, Shipping Board Radio Section; W. F. Hurlburt, Wireless Improvement Co., Jersey City, N. J.; Harold Hymans, Radio Service & Mfg. Co., New York City; Abraham Kutner, Philadelphia; F. F. Looch, Allen-Bradley Co., Milwaukee; Arthur Lynch, "Radio Broadcast," New York; W. B. Nevin, Radio Distributing Co., Newark, N. J.; R. S. Ould, Bureau of Standards; F. W. Magin, Industrial Controller Co., Milwaukee; W. H. Taylor, A. H. Morton, G. Sleeper and J. C. Sleeper, Sleeper Rodes Co., New York City; I. P. Rodman, Gardner-Rodman Corp., New York City; E. Steinberger, Electro-se Mfg. Co., Brooklyn; Paul G. Weiller, Gregg & Co., New York City; Dr. S. W. Stratton, Bureau of Standards; Dr. Louis Cohen and Captain Guy Hill, United States Signal Corps; Com-

mander, S. C. Hooper, U. S. Navy; Donald Wilhelm, Department of Commerce; L. E. Whittemore, Bureau of Standards.

During the first day's sessions, Commander Hooper representing the Naval Radio Engineering Section, pointed out the value of an organization of reputable manufacturers to the country as an asset to national defense, and urged the co-operation of manufacturers with governmental radio apparatus specifications.

"The Navy Department," he said, "has practically made the present state of radio communication possible by its specifications of a standard vacuum tube and other devices." Standardization is one of the most important needs of the industry, he stated, explaining that we can not afford to have lamps made by one firm which do not fit into the sockets made by another. "Due to the inability of the radio manufacturers to cope with the tremendous demand for apparatus which swept the country recently," Commander Hooper pointed out, "practically a million men and boys have been forced to build their own sets, with the result that they know a lot about radio, as much perhaps as if they had taken an ordinary B. S., college course. When these young men enter college they will demand advanced radio-work, thus increasing our knowledge in radio development, besides being a potential asset in the number of operators in the event of wartime needs." Captain Guy Hill, Army Signal Corps, and Dr. L. duP. Clement also spoke on the future of radio development, regulation, and standardization.

A trip to the Washington Navy Yard was made by the delegates, and Commander Hooper escorted a number of the visitors through the big Arlington Station. All the delegates and a number of government officials attended a banquet, where Dr. S. W. Stratton, Dr. Louis Cohen and representatives of the Department of Commerce and Shipping Board Radio Section talked about radio. On the closing day, the manufacturers were the guests of Dr. Stratton and Dr. Dellinger at the Bureau of Standards Radio Laboratories.

Much remains to be accomplished before the Radio Chamber of Commerce completes its national scope and begins to function in the control of standard apparatus; but the officials expressed themselves as well satisfied with the progress made and the co- with the progress made.

Practical Measurements of Capacity and Inductance

By W. A. Dickson

THE calculation and measurements of capacity and inductance in radio-receiving circuits, besides being necessary for accurate design, presents a very interesting subject for the amateur experimenter. Provided the methods and formulas described herewith are correctly followed out no difficulty should be encountered by the beginner.

Where it is desired to determine the inductance and capacity of the antenna, a wave meter and standard units of inductance and capacity are

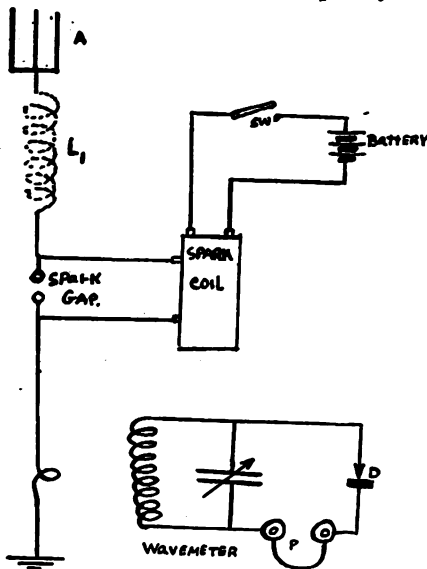


Figure 1. Schematic diagram showing how to measure or calculate the wave length of a circuit. With the aid of a wave meter the inductance coil L-1 may be measured. Drawn by W. A. Dickson.

required. The aerial is excited by a spark coil, or buzzer, and the wave meter placed in an inductive relation to it, as shown in Figure 1. The reading thus obtained we will call W_1 . With the standard inductance L_1 inserted in the antenna circuit, a second reading on the wave meter is taken which may be designated by W_2 .

$$\text{Then } L = \frac{W_1^2 L_1}{(W_2^2 - W_1^2)}$$

Where L is the inductance of the antenna in microhenrys.

L_1 is the inductance of the standard in microhenrys.

The capacity of the antenna may be measured in practically the same way. The natural wave length, W_1 , is found, and with a standard condenser C_1 , of .001 mfd. capacity, inserted, a second reading is taken on

the wave meter, W_2 . As it can readily be seen, W_2 is less than W_1 .

$$\text{Then } C = \frac{W_1^2 - W_2^2}{W_2^2} \times C_1$$

Where C is the capacity of the antenna in mfd.

The capacity of the antenna, or of some other unknown condenser, may be measured by the bridge method. The condenser of which it is desired to determine the capacity, designated in Figure 2 by C_1 , is con-

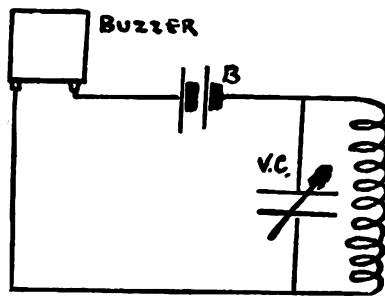


Figure 2. Schematic diagram showing how to measure the capacity of a condenser if the other values are known. Drawn by W. A. Dickson.

nected across the X terminals of the bridge. C_2 is a standard variable condenser calibrated in microfarads. R_1 and R_2 are the variable resistance units of the bridge. An ordinary telephone-transformer is shown at T, the primary of which is in series with a buzzer and battery. The apparatus is excited and the values of R_1 and R_2 varied until a minimum of sound is heard in the phones.

$$\text{Then } C_1 = C_2 \times \frac{R_2}{R_1}$$

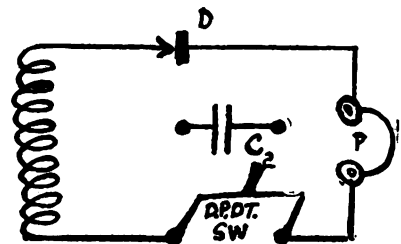
It must be borne in mind that the capacity of the antenna when measured by this method is only the simple capacity and is usually greater than the effective capacity which would be the value when the antenna is traversed by radio-frequency currents.

The effective capacity may be measured by the method shown in Figure 3. A variable condenser and inductance is excited by a buzzer and the oscillations act on a circuit containing inductance, capacity, crystal detector and phones. C_2 is a standard variable condenser calibrated in microfarads, and C_1 is the condenser of which the capacity is to be determined. An arrangement

consisting of a double-pole double-throw switch allows either condenser to be inserted in the circuit. The inductance is varied until maximum sound is heard in the phones using C_1 . The switch is then thrown, placing C_2 in the circuit, and its capacity is varied until maximum sound is again recorded in the phones. It will then be seen that

$$C_1 = C_2$$

With the same apparatus as in Figure 3 the effective inductance of a coil may be readily calculated. C_2 is shunted across the coil and the



circuit adjusted to resonance with the oscillating circuit. If it is a standard wave-meter, the wave length, or natural oscillating period, of the coil may be read directly,

$$\text{then } L = \frac{W^2}{C_2 \times 3.52}$$

where L is the inductance of the coil in centimetres.

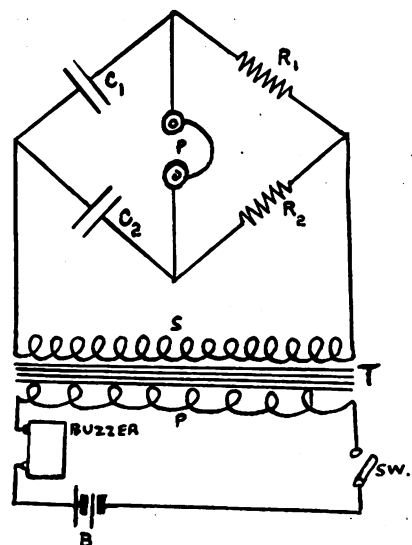
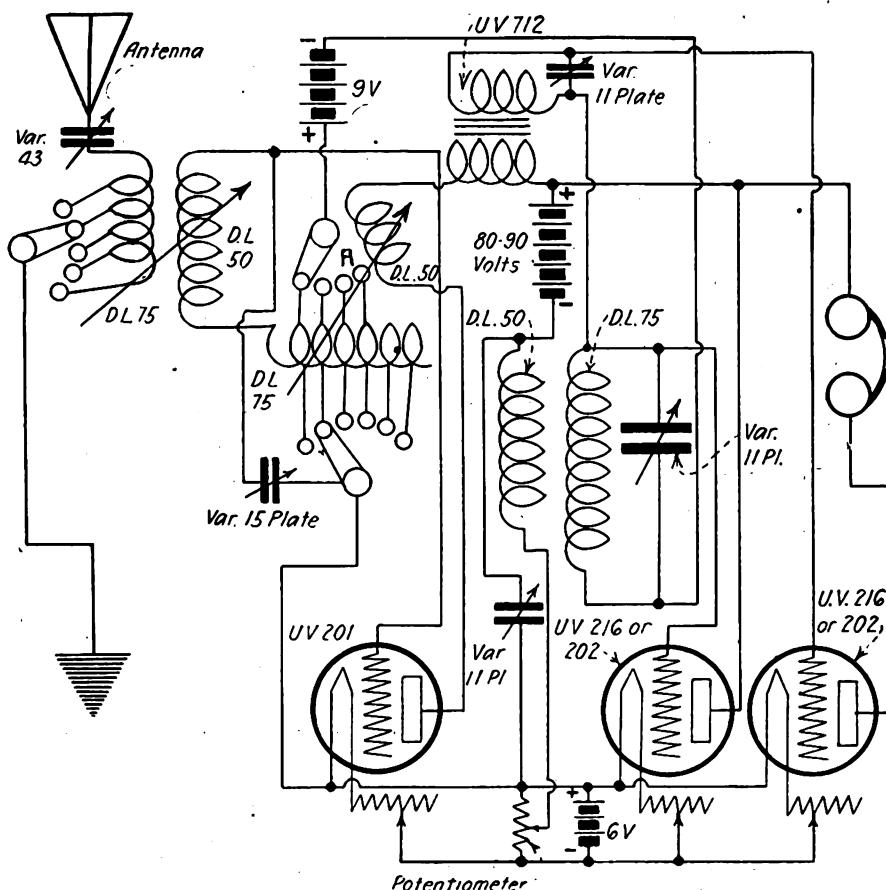


Figure 3. How the effective inductance of a coil may be readily calculated. Drawn by W. A. Dickson.

Experimenting with Armstrong Circuit, Oklahoma Doctor Produces Unusual Hook-up



Schematic diagram of Dr. Kelly's circuit, by which he secures remarkable results in amplification. The diagram resembles that of Major Edwin H. Armstrong, with several minor changes, which Dr. Kelly developed while experimenting with the Armstrong superregenerative circuit. Suggested by Dr. O. S. Kelly. Drawn by S. Newman & Co.

DR. O. S. KELLY, of Oklahoma City, Oklahoma, sends to RADIO WORLD the interesting hook-up published herewith. Dr. Kelly tells us that his circuit is the result of an accident while he was working on the Armstrong superregenerative circuit in connection with combined radio-frequency and audio-frequency after the French ideas of 1918 and 1919. He claims that his hook-up handles static in a very satisfactory manner and brings in signals. By experimenting and making changes on the transformer and coils of wire, when connected correctly, give remarkable amplification.

The apparatus used by Dr. Kelly in his hook-up are as follows:
2 vario-couplers, 180-degree coupling.

- 1 50-turn duolateral honeycomb coil.
- 3 11-plate variable condensers.
- 1 15-plate variable condenser.
- 1 43-plate variable condenser.

Letter A represents 2 variometers in the place of the loose-coupling feedback, which will work satisfactorily.

UV 712 is the type number of the RCA audio-frequency transformer.

UV 201, UV202 are type numbers of their tubes.

UV numbers may be purchased by anyone handling RCA material.

Novel Makeshift Loud-speaker

By De Witt H. Thompson

(See photograph on front cover of this number of Radio World.)

THE radio fan who has at his disposal an electric heater has the basis for a novel loud-speaker. This is accomplished by removing the radio receivers from the headband, hanging them over the heating element, as shown in the accompanying photograph, and connecting them to the radio-receiving set with one or more stages of amplification. For best results, it will be necessary to experiment with various positions of the receivers, within the reflector of the heater, until the proper focus is found. While such a makeshift loud-speaker is by no means as efficient as a phonograph horn, the writer has obtained fair results with it on music and speech from WHA, about fifty miles away, using a short-wave regenerative set, one stage of audio-frequency amplification and Murdock 2,000-ohm phones. Furthermore, by experimenting with various positions of the receiver in regard to the reflector and noting the results makes an interesting experiment in acoustics.

Schedule of Stations Broadcasting Press News from Various Parts of the World

(These stations use spark signals)

CALL	STATION	METERS	TIME
NAA	Washington, D. C.	2500	10 p.m.
NAR	Key West, Fla.	1500	10 p.m.
NAX	Colon, Panama	2400	10 p.m.
KHK	Honolulu, T. H.	600	11:30 p.m.
NFG	San Francisco	600	1:15 a.m.
NFL	San Diego, Cal.	2400	No Schedule
NAH	New York City	1832	9 p.m.
BZM	St. Johns, N. F.	1500	7:30 p.m.
VCU	Barrington Pass., N. S.	1500	8 p.m.
BZN	Falkland Islands	4300	3:30 p.m.
BZL	British Guiana	1300	6 a.m.
BYZ	Malta (Rinella)	2650	9 a.m.
OAZ	San Cristobel, Peru	1500	2 a.m.
BXY	Hong Kong, China	2000	9:45 p.m.
BXW	Singapore	2000	9:15 p.m.
UA	Nantes, France	2400	3:30 p.m.
FL	Paris, France	2500	3 p.m.
YN	Lyons, France	5000	8 p.m.

All stations along the Atlantic and Pacific Coasts broadcast their weather reports at 8 a.m., noon, 4 p.m. and 8 p.m., daily.

handling the surface of the crystal with the fingers. This generally pertains to the galena crystal. Where this has been done and the surface of the crystal is found to be less sensitive after continued use, it should be scraped lightly with a penknife. Sometimes a gentle rub off with a little alcohol will create a sensitive spot. If a crystal detector can be enclosed in a glass case where the hands cannot touch it, sensitive spots could be created more readily and stand less chance of jarring any sensitive spot that has been secured.

The Care of Crystals

IN receiving-circuits employing crystal detectors, the effective range depends a great deal on the sensitivity of the detector. As a rule, there are some crystals that are more sensitive than others, but even a sensitive

crystal may be ruined by improper care. There are times when the action of the air on the surface of these crystals starts oxidization and prevents them from functioning properly; but a more serious trouble is caused by

Radio World's Hall of Fame



MAJOR EDWIN H. ARMSTRONG

Inventor of the Armstrong Superregenerative Circuit

The incidents of Major Armstrong's struggle for recognition in radio comprise one of the most remarkable chapters of a life-story crowded with romance. He began experimenting with radio, as an amateur, when he was fifteen years old. It was during the period of this early work that he discovered and diagramed what is known as "the Armstrong feed-back circuit," without which long-distance telephone-communication and broadcasting, as it now exists, would be impossible. Litigation over this invention lasted several years, but ended in a complete victory for Major Armstrong. This legal battle ensued while the young inventor was in the service of his country during the World War. Major Armstrong was graduated from Columbia University in 1913. He holds a degree of electrical engineer. His fame as an investigator was recently enhanced to world-wide eminence by his discovery of the Armstrong superregenerative circuit. This is the most widely discussed and important development in radio reception. He is only thirty-two years old. When the World War broke out he was studying for a master's degree at Columbia University, and was experimenting with wireless in collaboration with Professor M. Pupin in the Hartley Research Laboratory.

The Radio Primer

A. B. C. for the Beginner Who Must Have the Facts Put Plainly and Tersely, and all Terms Fully Explained

The Beginner's Catechism

By Edward Linwood

CAN more than one set operate successfully, utilizing the same aerial?

Don't operate more than one set at any one time utilizing the same aerial. If this is done one set will tune the other out.

* * *

May iron wire be used as an aerial in place of copper wire? What is the reason for using copper wire?

Iron, steel, or galvanized wire is never used for aërials, because they have too low a resistance. Copper is used mostly by everyone simply because it is a better conductor of electricity than any of the other conductors mentioned.

* * *

What is the best aerial that can be erected for the short wave lengths?

A single copper wire from 100 feet to 150 feet long, and, at least, 50 feet high should answer this purpose. It is a good thing to remember that the lead-in should be taken off the end that points towards the station you desire to hear. This type aerial is known as the inverted-L type. It is directional.

* * *

Should the aerial be well insulated; or, can it be erected in most any fashion?

The aerial, being the first element depended upon for the reception of signals must, in all respects, be properly insulated. If the aerial is not insulated, considerable energy will be lost and signals received will be weak. Insulators should be placed at each end of the aerial with the wire between them.

* * *

Can loop aërials be safely operated during a thunderstorm? Can they be used to eliminate static? Do loop aërials require a ground when operating? Are they directional?

The indoor, or loop, aerial is coming rapidly into favor. During a lightning storm, the danger of listening in amounts to nothing. This is the advantage of the loop. Furthermore, this type aerial is directional and has another main advantage of eliminating

static to a greater degree than that of the outdoor type. Ground connections are not used with loop aërials.

* * *

How should antenna wires be erected? Should joints be soldered? What effect will the signals have if aerial is run close to power light lines?

All antenna wires should be constructed and erected in a durable manner, and should be located so as to prevent electrical contact with any power-light wires. When run near power-light wires, the aerial should be run at right angles to such wires. If this is not done, serious trouble will be encountered and may be traced direct to this very problem. All splices and joints should be soldered unless made with the approved splicing devices or clamps. Care should be taken that the lead-in wires are properly brought in through a non-combustible, non-absorptive insulating bushing when entering the building.

* * *

What is this so-called static and when is it present? What steps can be taken to prevent this disturbance?

Usually in the late spring, summer, and early fall the air is filled with static. It is a disturbance which creates much disfavor with radio fans. This bugbear cannot be eliminated at the present time as nothing has been invented that will keep it out entirely. Several methods may be used to help eliminate a part of static, particularly by using the indoor loop and by the employment of radio-frequency circuits.

Static is the heat and moisture of the clouds created by an accumulation of electricity above the earth. When this charge is of sufficient strength to discharge itself, it jumps to earth. This is called lightning. It causes that drum-banging noise in the ear pieces. This is a signal for the approach of a storm.

Radio World's Revised Radio Dictionary

By Fred. Chas. Ehler

Protective resistance rod—A high resistance made of graphite, carbon, or other material in the form of a rod. It is used to prevent high-frequency currents from coming in contact with low-frequency circuits. Usually the ends are connected across the terminals of the power lines with the center of the rod grounded. This rod allows the high frequency electrical surges to be grounded, thereby preventing the blowout of the power apparatus and instruments.

Quenched Cap—A spark gap generally made up of a number of gaps separated by insulating washers of mica or fish paper.

Radiation—The transmission of energy through space in the form of electromagnetic waves.

Radio frequencies—Vibrations not audible to the human ear. Frequencies above 10,000 cycles per second are termed radio frequencies.

Reactance—See Impedance.

Reactance Coil—A coil wound upon an iron core and so arranged that the number of turns can be varied or the position of the iron core can be adjusted. It is used to regulate the power input of a transmitter.

Receiving detector—A device arranged so as to change the incoming oscillations, so that they may become audible in the head telephones.

Rectifier—A device for rectifying the alternating currents into pulsating direct-current.

Receiving Inductance—The aerial tuning inductance allows adjustment of the aerial circuit to wave lengths greater than the natural wave length of the aerial circuit.

Regenerative—(Known as the Armstrong circuit). A circuit using a vacuum tube so arranged that after detection and rectification, the signal introduced in the plate circuit is led back to or caused to react on the grid circuit, thereby increasing the original energy of the signal received by the grid and greatly amplifying the response to weak signals. Usually a coil, known as a tickler, is placed in the plated circuit of a vacuum-tube receiver to transfer part of the energy of the oscillating plate-current back into the grid circuit in order to produce amplification and to enable the tube to generate oscillations of high frequency.

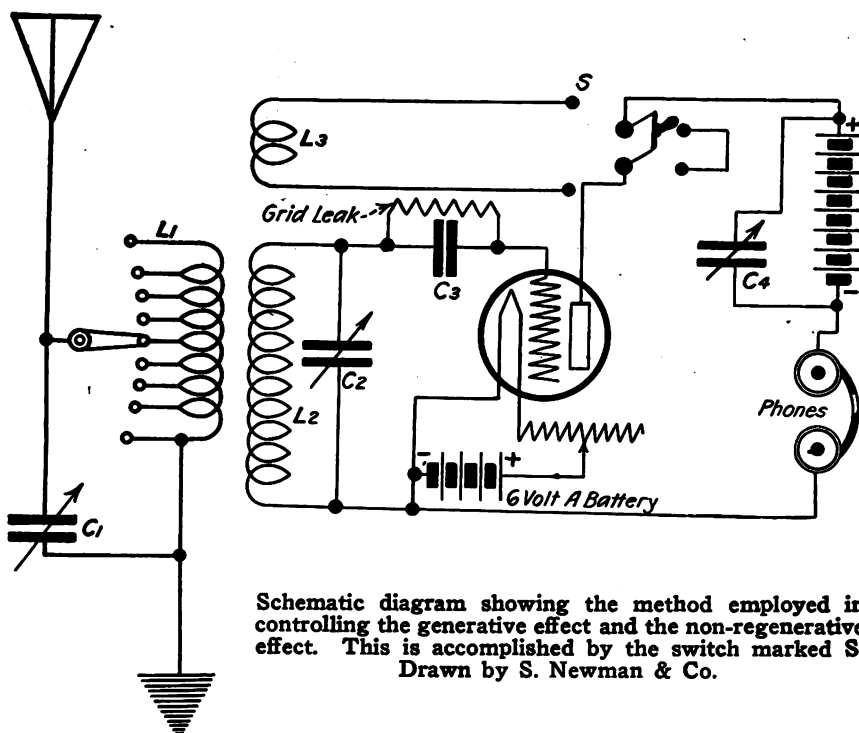
Resistance—All metals have more or less electrical resistance, copper is used universally, due to its low resistance, low cost and ready supply. Resistance is opposition to the flow of an electric current through a conducting medium.

Rheostat—A resistance coil usually provided with a means of varying the amount of resistance necessary to use.

Rotor—The movable part or inner part of a variometer or induction motor.

The Radio Primer has been published regularly in RADIO WORLD since issue No. 1, and will be a regular department in order to instruct and aid the many thousands of amateurs who are joining the ranks of radio enthusiasts every week.

How to Secure Perfect Regeneration



Schematic diagram showing the method employed in controlling the generative effect and the non-regenerative effect. This is accomplished by the switch marked S. Drawn by S. Newman & Co.

FOR short wave-lengths many amateurs use tuning circuits employing the principles of Major Edwin H. Armstrong's super-regenerative circuit. However, with the various wiring diagrams, many do not get a maximum of result. This, probably, is due to the fact that the manipulation is too much for the average amateur. To overcome this, the accompanying hook-up will show the use of the regenerative effect in the Armstrong circuit.

L-1 is the primary circuit of any loose-coupler or vario-coupler set. L-2 represents the secondary winding, while L-3 is the so-called "tickler" coil which is connected in series with the plate circuit and placed in inductive relation to the high potential end of the secondary coil, L-2.

The tickler coil may be cut in or out of the circuit by the switch marked S. When the switch is placed at the right, a "plain detector circuit" is the result; but when thrown to the left the tickler coil is connected in the circuit and the regenerative-amplification effect then obtained.

This regenerative connection will amplify the incoming signals about six times. It is possible to design the primary and secondary coils L-1 and L-2 of the tuning coil so that for the range of wave lengths—200 to 600 meters—tuning may be accomplished by the condensers C-1 and C-2 alone.

In this circuit the experimenter may learn how to employ the tickler coil and understand its uses. Keep the switch at the right until the incoming signal is heard in the head phones. After the adjustments are made, throw the switch to the left, cutting in the tickler coil. By adjusting this coil the amplification process will take place and the strength of signals immediately noticed. By the adjustment of the other instruments, signals should come in loud and clear. This is one of the best methods of learning the regulation of the tickler coil in a circuit. When a compact set is purchased, some knowledge of the tickler coil will be gained. To-day there are scores of amateurs who do not understand regeneration.

The Importance of Correct Tuning

By Harold Day

UNDER ordinary circumstances, while listening in, the set may be kept closely coupled. This broadens the tune, particularly if a considerable amount of inductance is used. The aerial circuit should be tuned with a variable condenser in series for short waves, and in shunt to primary for long waves. When the calling station is well tuned in—and if there is interference—the coupling will have to be loosened. This should be done gradually, adjusting both the open and closed circuits with each change of coupling, until a point is reached where signals are readable through the disturbances.

For further improvements in tuning the closed-circuit condenser should be made as large as possible and the closed-circuit inductance considerably reduced. The practice of loosening coupling, while receiving, should be made obligatory on all who operate a set; for it not only cuts out existing interference, but prepares for any interference which may arise during reception. Owing to the change of effective self-induction, in both circuits, both require readjustment (retuning) with each change of coupling.

Two aerials in the immediate vicinity, as on the same ship, have an influence on each other; so that if both are used for receiving at the same time, the tuning of one will effect the other. This effect may be observed between aerials if they are very close together.

front page of our cover of this issue of RADIO WORLD shows the radio room where information of vital importance to miner, rancher, orchardist, and lumberman is being disseminated by means of the radiotelephone. By this new plan, many of the farmers and business men throughout the country, equipped with receiving sets, may listen in.

Turn to the photograph. The operator, seated at the table, is broadcasting. At his left hand may be seen the shift handle which enables him to change to the various wave lengths in a moment. At the left corner of the table, is the hot-wire ammeter, which tells him the exact amount of power that is being radiated from the aerials. To the right is the giant transmitter with all its necessary equipment. On the upper shelf of the stand are the four pilotrons that make radiotelephony possible.

Transmitting at the United States Post Office

(Describing photograph published on the front cover of this issue of Radio World)

THE up-to-date farmer and the business man in the remote sections and smaller towns no longer depend on the newspaper for important news pertaining to weather, crops

and finance. Their needs in this direction are supplied by the powerful radio broadcasting station operated by the United States Post Office at Washington, D. C. The photograph on the

How Two Young Women, Radio Secretaries, Became Radio Experts

By C. D. Wagoner

IT seems rather a far cry from preparing technical reports on high-frequency radio alternators and multiple tuning to winding a spider-web inductance on a piece of cardboard that once held a hair net; or from writing a lengthy report on activities of the radio department of a big electrical concern to putting up an antenna in the back yard and finding the sensitive points on a second-hand galena crystal, yet this is what has been accomplished by Miss B. M. Apkes, secretary to E. F. W. Alexanderson, chief engineer of the Radio Corporation of America, and Miss Esther McInnis, secretary to David Sarnoff, general manager of the Radio Corporation.

Miss Apkes became interested in the manufacture of a home receiver soon after the broadcasting station at WGY was opened. Schenectady dealers, at that time, were just as shy of receivers as dealers in all other parts of the country, and so, in desperation, Miss Apkes decided to build her own set. Bits of conversation held with Mr. Alexanderson in his office, extracts from letters and reports written by him, came to her little by little. Finally she made a rough sketch of the set she planned to build. No sooner was the drawing finished than the actual work began. A piece of cardboard nearby served as a basis for winding the coils; a few dozen feet of enamel-covered wire on a discarded spool furnished the conductor itself; the ever-present scissors were available to cut the slots in the pasteboard for the in-and-out winding.

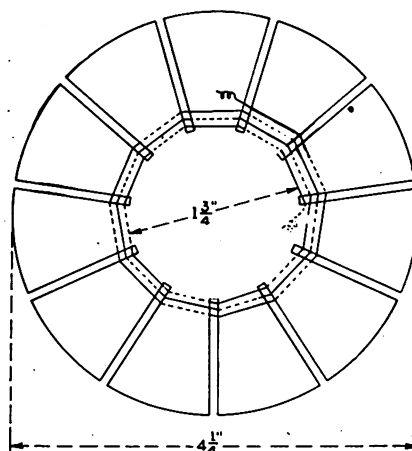
Soon the coils were wound, the number of turns necessary being "guessed at." The top of a cigar box made a nice, smooth surface to use as a base. Now nothing remained but binding posts and a detector.

Here is where the advantages of friendship came in. Miss Apkes appealed to some of her associates in the radio department showing them the coils she had made, as evidence of good faith. At once she awakened interest. One friend offered her a galena crystal and showed her how a fine wire "point" could be made up easily; another donated a



MISS B. M. APKES

Secretary to E. F. W. Alexanderson, chief engineer, Radio Corporation of America.



Schematic diagram showing the 27 turns of No. 24 B. & S. enamel-covered copper wire.

few binding posts; a third loaned her a pair of head telephones. A few gouges of the scissors, and holes were made in the base for the binding posts; a few turns of the penknife, and the posts were screwed in place and wired up.

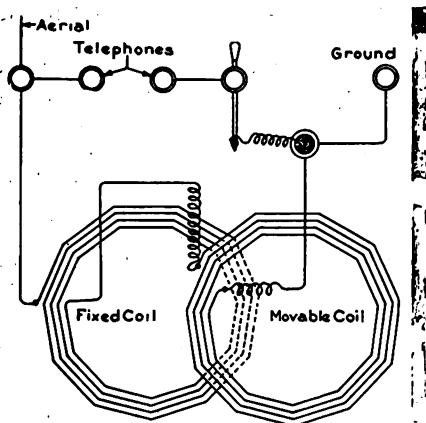
Miss Apkes now put up a single-wire antenna at her home, running about ninety feet from the top window of the house to a tree, and then the set was connected up. At first nothing was heard, and her enthusiasm fell considerably; but soon she thought of the coil windings and began removing turns. After a number of turns had been removed from each coil, faint signals began to come in from the powerful Schenectady broadcasting station. Moving one coil over the other slowly, Miss Apkes heard the signal come up gradually to a maximum, when clear, loud reception was

heard. It worked. Marconi, fifteen years ago, hearkening to the three S's across the Atlantic, was no prouder than this fair radio enthusiast receiving the General Electric band "over the radio."

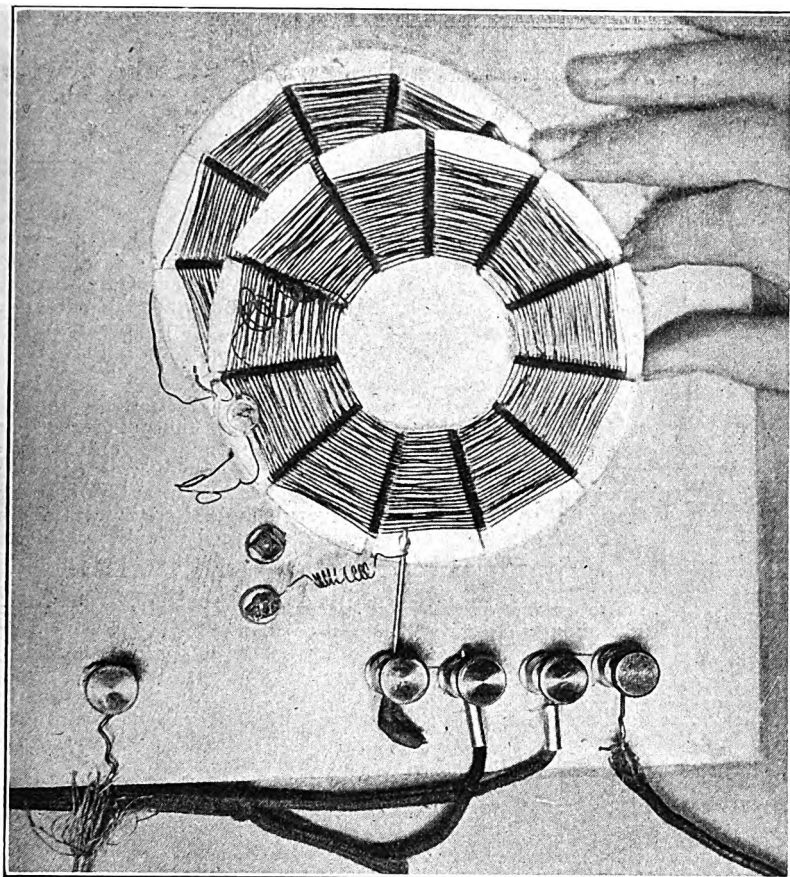
Since that time, Miss Apkes has gone into quantity production and has turned out a set for Mr. Alexanderson, which he and his family enjoy nightly. She also sent a set to the Radio Corporation offices in New York. No sooner did this arrive, than Miss McInnis saw in it a way of trying out in practice what Mr. Sarnoff so constantly was preparing memoranda on; and that very evening an improvised antenna was strung from a window in a New York apartment to another building not far away—and WJZ came in well! Two radio fans were added to the million or more already in existence.

Miss Apkes' design is a single-circuit receiver with a variometer inductance in series with the antenna, and across this a crystal detector. The inductances are two in number, both of the same size, and are wound in the spider web form for convenience of construction. Twenty-seven turns are wound on each coil, the wire being No. 24 B. & S., enamel covered. A galena crystal is used as detector.

Although obviously this receiver suffers in comparison with a standard-crystal detector set, both as to ease and flexibility of adjustment and as to sensitiveness, nevertheless the underlying idea of starting out with a set as near to fundamentals as possible is right. Too many radio listeners have worked with advanced type sets only. These amateurs



Schematic diagram showing wiring of receiver.



How the set is operated. Fully described in the accompanying article.

(Continued from preceding page)

lack the perspective and knowledge of what they are doing, the knowledge possessed by those who have struggled upward from more humble sets. It is no idle prophecy that it will not be long before both Miss

McInnis and Miss Apkes will be owners of sets embodying all the latest devices in tuning, detection, and amplification. Their mastery of the simpler set first will mean that they will more easily master the



MISS ESTHER McINNIS

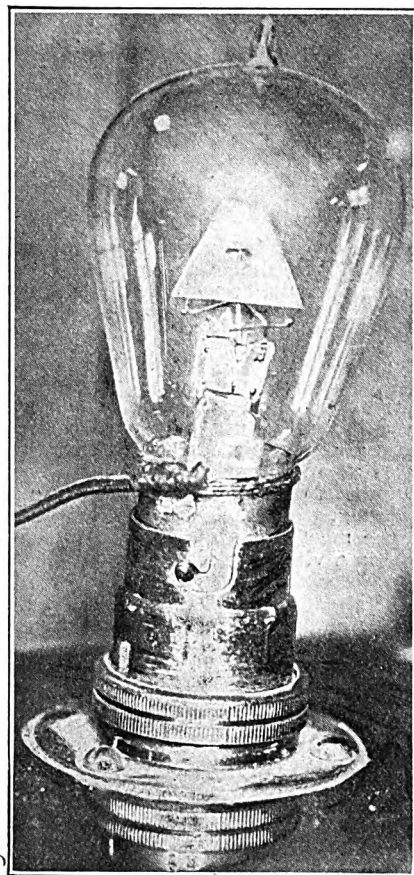
Secretary to David Sarnoff, general manager, Radio Corporation of America.

more complicated sets that follow.

Then, of course, the element of expense comes in. One naturally feels timid at investing money in a receiver until one feels sure that it will work. The receiver described is really about the ultimate limit in the matter of cost, for, provided one's friends come across with binding posts, galena crystal, and headphones; and provided, also, that one can stumble over an unattached spool of enamelled wire, the total cost of the set is about one cent, for pasteboard, and even that may be eliminated if one uses a shoe-box cover.

Best of all, however, is the fact that Mr. Sarnoff and Mr. Alexander now give only a skeleton outline of the reports that they want, confident that their secretaries, now wise by personal contact with radio's mysteries, will fill out the missing data without further instruction.

Daddy of the Vacuum Tube



(Central News Photo Service.)

Model of the first vacuum tube invented by J. A. Fleming, famous British radiotrician, and carefully preserved at the College of the City of New York in its research laboratory. This valve contains only a filament and plate, and is the daddy of the present-day three-element tube, without which the radio art would still be in the spark-coil-and-crystal-detector stage.

Radiograms

Latest Important News of Radio Garnered from the World Over, and Reduced to Short Wave-Lengths for the Busy Reader.

SYMPTOMS of a strange malady were diagnosed at sea by radio. Dr. Lee Brown, of the Royal Mail liner "Oropesa," which arrived Saturday from Southampton, was called upon, during the voyage, to prescribe for several of the crew on the Danish freighter, "A. T. Lanterhavet," who were suffering from a mysterious malady. The Danish vessel, which was then many miles distant from the "Oropesa," had come from Malta and was bound for New York. Dr. Brown, who had been connected with the British squadron stationed at Malta during the World War, at once recognized from the Danish captain's description of the symptoms that the men were suffering from Malta fever, a species of malaria. He sent a message by radio prescribing the necessary remedies and outlining a course of treatment which had the desired effect, he claims, as no other call for aid was received.

* * *

A prescription relayed by radio was the means of saving another sailor's life. The man was aboard a British vessel in the Mediterranean and was taken critically ill. His captain broadcast a report of his condition, asking medical advice. A French vessel picked up the message, but no one could read English, so the operator relayed it to another French ship. On this vessel the doctor understood English but could not prescribe in the language. He, in turn, broadcast a prescription in French to another French ship, where it was translated into English and forwarded to the original vessel, where the captain followed instructions and the sailor recovered.

* * *

Captain Amundsen, the arctic explorer, has sent a radiogram from Nome, Alaska, that he has postponed his proposed trip over the North Pole in a radio-equipped airplane for one year.

* * *

Radio communication between this country and Norway may become a reality when the new station now being built on the summit of Rundemandon, a 2,500-foot mountain near Bergen, Norway, is completed. The improvements now under construction consist of arrangements for a radio telegraph station with a 3,000-kilometer radius and an 800-kilometer phone for communication with England. The service will be in operation in one month.

* * *

For a period of two years, licenses for broadcasting, granted in Great Britain, should contain the provision that only British instruments should be used. This is the recommendation of the postmaster general, and, according to "The Evening Times," London, has been approved by the Cabinet.

* * *

Radio messages recorded during the operator's absence is the latest. A radio relay recorder that receives and copies messages without the use of a trained radio-operator, operates mechanism automatically in accordance with the signal received and acts as an automatic call system has been perfected by F. W. Dunmore, of the radio laboratory of the Bureau of Standards, Washington, D. C. It is sensitive enough to convert, accurately, the most insignificant radio-signals into records, yet will operate in a vibrating airplane.

* * *

The United States Department of Labor is to broadcast. Not to be outdone in radio activities by the Agricultural, Post-

office, Commerce and other civil departments of the Government, Secretary Davis has decided to put the Labor Department on the radio map and tell the world what it is doing. To this end he has officially asked the co-operation of the Navy Department in broadcasting labor activities and news relative to immigration quotas, labor arbitration, employment and child labor, as well as other official business.

* * *

If the broadcasting fever hits Great Britain as hard as it has hit the United States the subject of the government splitting the tax on receiving sets with the companies carrying on the broadcasting will prove no mean source of revenue. American amateurs little realize the advantages of living on this side of the water, as every single British station, both for sending as well as receiving, is forced to take out a license and pay a substantial fee.

* * *

The entire question of patents in crystal-set construction will shortly be aired in open court as the result of a suit by the Freed Eisemann Radio Corporation against the Wireless Specialty Apparatus Company, in the Supreme Court of New York County, alleging unfair business competition by the latter firm, in publishing a series of trade advertisements containing a series of patent warnings. The plaintiff asks an injunction and \$150,000 in damages. In the mean time the defendant in this suit is in turn suing in the United States District Court of the Southern District of New York, alleging infringement of three of its patents by the Freed Eisemann Corporation.

* * *

"This resort has gone wild over the radiophone!" writes the Lake George, New York, correspondent of "The World," New York. Most of the hotels, restaurants and even the small tea rooms have their outfits for giving radiophone concerts and special stock market reports to their patrons. At Newport, Bar Harbor, and throughout the Adirondack region, many of the leading hotels and private residences consider radio a necessity this summer.

* * *

A woman from Chicago went to Coney Island to hear her daughter back home singing by radio and being heard in one of the concessions at the park.

* * *

Do you love adventure? Here's a rare radio trip. The following advertisement appeared in the New York City newspapers last week:

WANTED—A radio operator who also is an experienced mechanic, one with aviation experience preferred, to fly from New York to Brazil, up the Amazon for a thousand miles, the final destination being the World's Exposition at Rio de Janeiro, celebrating Brazilian independence. Write (do not call), telling of experience. Hinton-Martins Flight to Brazil, Room 1608, No. 111 Broadway, New York City.

If it is achieved, the flight to Brazil will not only be an historic feat in aviation but in radio as well.

* * *

Giving "radio equipped" as one of the attractions, two New York City residents advertised their furnished apartments for tenants.

Cleveland Bank's Radio Service

*Up-to-the-Minute, Four-Times-a-Day
"Newspaper" for Benefit of Patrons*

THE Union Trust Company of Cleveland announces, through A. H. Scoville, vice-president in charge of the bond department, the installation of a radio-broadcasting station which will be in operation on or about August 15. The new station will be a 500-watt outfit of the very latest design which, under favorable conditions, has an effective radius of 500 miles. From 9 until 9:45, and from 10 to 10:45 in the morning; and from 2

to 2:45, and from 3 until 3:45 in the afternoon the new Union Trust Radio Broadcasting Station will send out full and authoritative information on the major movements in the stock and bond market, together with latest prices on farm and dairy products. Intervals between quotations will be filled with the important financial news accumulating over the private wires of the company.

The new station will bring not only to the city dweller who owns a receiving set, but to the farmer as well, up-to-the-minute information on the major movements of the financial world, together with the vital news of all the markets. It will enable the farmer who does not himself own a receiving outfit to call up his local bank and obtain the very lat-

est quotations on his farm and dairy products, insuring proper buying and selling on the farmer's part. It will enable the city dweller within a radius of 500 miles of Cleveland to obtain the very latest news from the financial world.

In effect, the Union Trust Radio Broadcasting Station will supply practically the entire Fourth Federal Reserve District with an up-to-the-minute four-times-a-day newspaper of the events of importance in the commercial and financial world.

Once a week, in the evening, from 7 to 8, the very best entertainment program available in Cleveland will be broadcast.

Radio World, 52 issues, \$6.00

Radio and the Woman

By
Crystal D. Tector

I NOTE with pleasure—for I am one of the keenest believers in the future of radio—that it is meeting with great favor, this summer, at many of the more fashionable resorts, notably Newport, Lake George, and the Adirondacks, and that, too, sets are being installed in some of the fine houses at Tuxedo which, as we all should know, throws open its doors when the autumn foliage turns from green to gold. It is amusing, however, to note that the resort reporters stress the fact that the men are benefiting by the radio because, while sojourning at mountain and shore, they may keep in touch with the everlasting market quotations.

* * *

I suppose such things are as necessary to the average man's existence as his cigar. Friend Husband says they are, though he is not a speculator—just an ordinary human being who does as his wife tells him. But I have received letters from several of my friends who are summering at some of the resorts mentioned, and they tell me that the women folk are being benefited by the radio just as much as the men. Don't imagine for a moment that the average woman who is so lucky as to pass an entire summer at some well-appointed country place, spends all her time sitting on a porch reading fiction and planning winter frocks. If she is of the up-to-date, smart, American type, she will golf or play tennis or swim or row—and she will have just as full-blooded an interest in the big things of the day as any of the male persuasion of her immediate family.

* * *

For that reason she will take the radio-receiving set as an integral part of her household. She will want to hear the daily news and, being feminine, all that is being broadcast about fashions. She will want to listen in whenever the report of a big tennis match, or a notable golf or polo event comes through the ether. She will, if she is like the friends I want to cultivate, feel the necessity of keeping an unrelenting interest in all that is important in world affairs—and radio misses nothing today—for she is now a very important part of our citizenry. She has the vote!

* * *

I think I told you that I interested Friend Husband in radio. He had but a small idea of its importance at first. He's a lawyer, specializes in wills, though he hasn't made enough to think it necessary to have a will of his own (I mean one of those legal documents wherein every well-appointed F. H. leaves all he has to his wife), and he didn't have the time or the inclination to read up on the newer things in science. My! how I used to bore him with what I read about radio. Finally, in sheer desperation, I suppose, he took it up and went into it heart and soul. Now it is a question as to which is the more enthusiastic "bug," he or I.

* * *

One of the fair summer boarders up here at Lake Hopatcong tried out her receiving set in her canoe, one day last week. She rigged up a loop aerial—she confided to me that she had taken her tip from a photograph published in RADIO WORLD—and paddled to the middle of the lake where she let the canoe drift while she tuned in. She picked up Newark and an amateur whose call she could not quite make out. She is quite an enthusiast. Next week, when she returns from a visit to New York, she promises to take me out with her. It must be a rare sport.

* * *

Last Thursday night I tuned in for the Leonard-Tendler fight. F. H. was so fussed up about it that I felt it my duty. At first he wanted to journey down to Dover, New Jersey, and get the returns at the local newspaper office, but I told him to stay at home and save himself the trouble. He was afraid, at first, that something might happen to prevent perfect reception—told me that he couldn't go to bed that night unless he knew who won and interjected several other mild objections. But I answered that he would get an earful regarding the affair if he would only be patient. Well, it worked in fine style. I spread the news among the neighbors. F. H. feared to do so lest some interference might spoil it all and they would be disappointed. We had a house full. Even the sheriff was present. I made another big bowl of my radio punch—which is, I can proudly say, the popular drink of the "lake," as we Hopatcongists call this neck o' the woods.

* * *

The news of the big fight came through our loud-speaker without a blemish. We heard the man who gave it out, round by round, clearly and distinctly. F. H. was delighted, because he could air his prize-fighting knowledge and explain to the

Only Woman Announcer



(C. Kadel & Herbert News Service.)

Station WOR, Newark, New Jersey, boasts the only woman radio-broadcast announcer in the United States. She is Miss Jessie E. Koewing, and is known to radio fans as "J. E. K." Many radio amateurs will be pleased to see Miss Koewing's likeness, having heard her voice many times.

uninitiated all the various technical terms. He was as busy as a bee in a meadow abloom with daisies. And he was pleased with the smart manner in which everything went off. I have always said that radio will keep husbands at home when nothing else will.

* * *

There is a young bride sailing for Europe next week to meet her husband-to-be. She wants to surprise him with a telephone call by radio when she is approaching the French coast. I understand that her parents, wishing to give in to every little whim that she may show, have gone to no end of trouble to bring the thing about—even to advising the young man to be on hand for the call lest his heart's desire pine away with disappointment.

* * *

A motor party journeyed through these parts, the other day, with the most thoroughly equipped radio set I have ever seen on an automobile. Their unusually large touring-car carried aërials a foot above the roof, and a special stand inside held the receiving set. Just to prove to me that it "worked," I accepted their invitation for a tour of the lake district and we caught several messages while in motion. At one place we stopped, made a ground, and caught a message from Arlington. And, the entire radio apparatus was in charge of a young lady of the party.

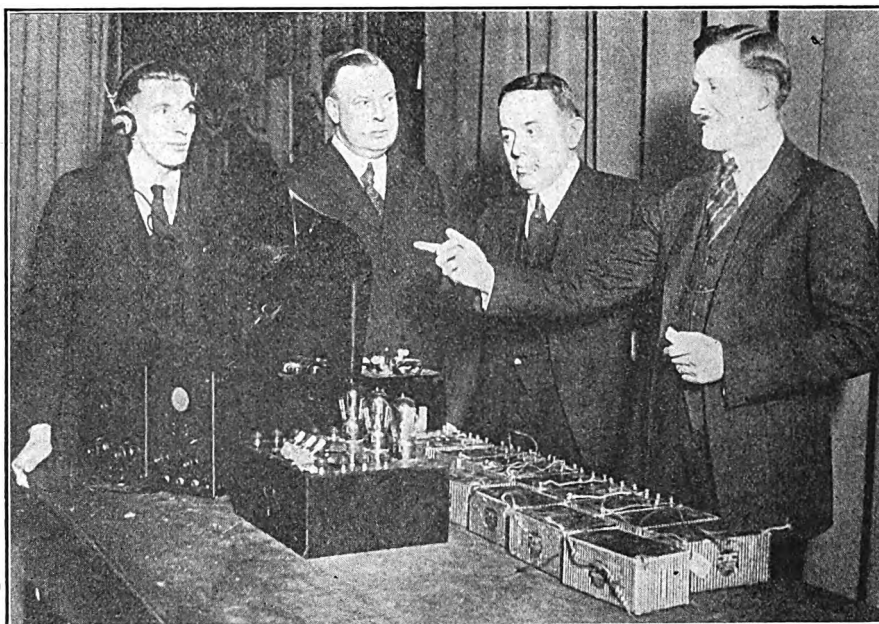
* * *

From my mail-bag:

Miss B. H. J., Staten Island, N. Y.—"Dear Mrs. Detector: I have just returned from a trip to South America. On the way home, I spent most of the time in the radio room of the steamer. Now I am a thoroughly dyed-in-the-galena radio fan. I want to be a radio operator on an ocean liner."

Mrs. L. P. R., Bloomington, Ill.—"I think that I can safely say that the women of my town are taking greater interest in their dress since fashions were radioed."

Photographic News of the Week Shows

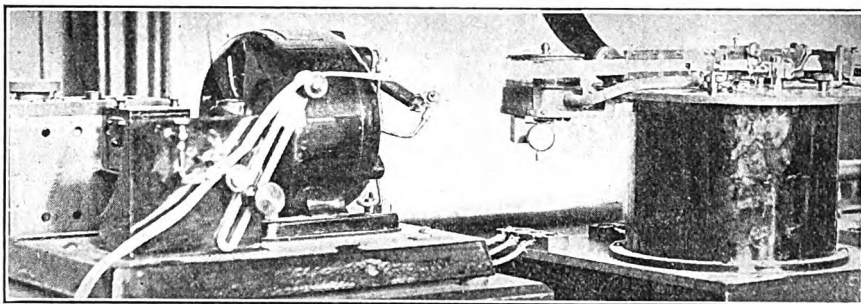


(Left) Morgan L. Eastman, director of radio concerts at the Westinghouse broadcasting station KYW, divulging some inside information regarding the marvels of radio. By stretching a single copper-wire across the Cameo Room of the Morrison Hotel, Chicago, and grounding a wire on the radiator in the room Mr. Eastman succeeded in picking up broadcast music. No exterior aerials were used; the apparatus was confined within concrete walls.

(C. International.)

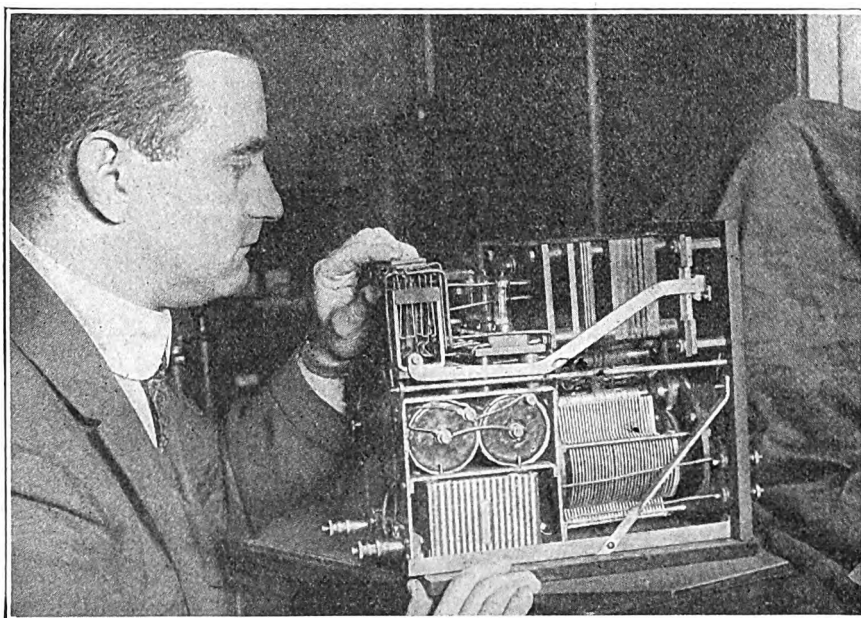
(Right) These up-to-date canoe radio fans have rigged up in their frail craft a practical amplifier and aerial. When the proud owners of the canoe were asked for information regarding their stunt they exclaimed: "It works!"

Underwood & Underwood.



(C. Central News Photo Service.)

This is a new device for recording high-speed radiotelegraph signals, particularly those received from Europe. The signals are amplified and then applied to a coil which is made to move in a powerful magnetic field. The motion of this coil is recorded on moving tape by means of a tiny glass pen attached. A record of the dots and dashes is faithfully reproduced.



(C. Kadel & Herbert News Service.)

Dr. A. N. Goldsmith and his new uni-control receiver. No taps are used, the inductance being varied by means of copper plates rotating alongside a coil. A complete detector and two-stage amplifier, using the new "peanut" tube, together with the accompanying filament and plate batteries, are included.



Radio Manufacturers Form National Organization

Radio Section of the Associated Manufacturers of Electrical Supplies to Stabilize Industry and Support Broadcasting

By Walter K. Emmet



C. E. HAMMOND Pirie Macdonald Almon U. & U., N. Y.
 Vice-President M. C. RYPINSKI CHARLES GILBERT ELMER E. BUCHER
 Chairman Treasurer Secretary

Four leaders of the Radio Section of the Associated Manufacturers of Electrical Supplies

PUBLIC interest in radio and, also, the manufacture and sale of radio apparatus, is utterly dependent on broadcasting. If the few broadminded radio manufacturers who now transmit music and speech at their own expense were to abandon their stations, the radio industry might collapse over night. Since broadcasting is directed to the public as a whole, the radio industry must consider the public as a whole. The situation thus presented calls for united action by the industry, for a clear vision of radio's possibilities, and for a certain degree of self-regulation.

The manufacturers of ordinary commodities may flourish without necessarily becoming members of an association formed to further the interests of their industry; but an association of radio manufacturers that think and act together must exist if the public interest in broadcasting and, hence, in radio, is to be maintained. Moreover, the radio industry must supervise itself and correct some questionable practices that have already manifested themselves. Radio corporations have been chartered literally by the hundreds, too many of them for the purpose of selling stock rather than of advancing the radio art.

In order to develop the support broadcasting, in order to stabilize trade conditions, an association must be organized with only reputable membership made up of members of the radio industry interested in the future development of radio. For this reason, the radio apparatus section of the Associated Manufacturers of Electrical Supplies has been formed to place the radio industry on a sound basis, to study the public taste in the matter of broadcasting programs, and to support and promote broadcasting stations. This Radio Apparatus Section was organized on March 19, 1921, at a meeting held at the Hotel Pennsylvania, New York City. At the second annual meeting, which was held at Spring Lake, New Jersey, during the week of June 19, the Radio Apparatus Section of the Associated Manufacturers of Electrical Supplies, definitely announced its program and the part that it intends to play in promoting the best interests of radio. At this meeting, the object to be attained by the Radio Apparatus Section was proclaimed as follows:

"To advance and protect the interests of

the manufacturers of radio apparatus; to promote the standardization of radio apparatus; to collect and disseminate information; and to promote cooperation among the members."

The membership of the Radio Apparatus Section is confined to bona fide and trustworthy manufacturers. That this ideal will be realized, may be inferred from the names of the following members who constitute the section at present:

Acme Apparatus Co., American Radio and Research Corporation, L. S. Brach Supply Co., C. Brandes, Inc., Burgess Battery Co., Clapp-Eastham Co., Cutler-Hammer Co., DeForest Radio Telephone and Telegraph Co., Dictograph Products Corps., Edwards and Co., Electrical Products Mfg. Co., General Insulate Co., A. C. Gilbert Co., Holtzer-Cabot Electric Co., Manhattan Electrical Supply Co., W. J. Murdock Co., Pacent Electric Co., Radio Corporation of America, Signal Electric Co., Stromberg-Carlson Telephone Mfg. Co., Telenduron Co., Western Electric Co., Westinghouse Electric & Mfg. Co.

Of equally high standing are the officers. M. C. Rypinski, vice-president and sales manager of C. Brandes, Inc., is chairman of the radio apparatus section. The eastern vice-chairman is C. E. Hammond, secretary-treasurer of the Signal Electric Co. Charles Gilbert, president of the DeForest Co., is treasurer of the association. The secretary is Elmer Bucher, sales manager of the Radio Corporation of America.

M. C. Rypinski, chairman of the executive committee of the Radio Section has long been associated with the electrical industry in general. An engineer of high standing, he is also a sales and merchandising expert, having been in charge of the radio sales of the Westinghouse Electric and Manufacturing Co. He early advocated the commercial exploitation of the radiophone and assisted in the direction and operation of the first Westinghouse stations. This pioneer work of Mr. Rypinski has given him an insight to the commercial side of broadcasting and radio-merchandising problems possessed by few other men.

Mr. Rypinski is a native of Texas, of the Rose Polytechnic Institute at Terre Haute, Indiana. He was graduated in the class of 1897 and entered the employ of the General

Electric Company as assistant to the chief of the Standards Laboratory. From 1903 to 1906, he was engaged in instrument manufacturing after which period he joined the Westinghouse Electric and Manufacturing Co., Dictograph Products Corp., Edwards association with the Westinghouse Company, he joined C. Brandes, Inc. Mr. Rypinski's organizing ability is manifested in the work he has done in the National Electric Light Association, the American Institute of Electrical Engineers, the Illuminating Engineering Society, and the Electric Power Club.

Louis G. Pacent, eastern vice-chairman of the association, has been identified with the industry for the past fifteen years. Mr. Pacent started his career as an amateur. To-day he is a well-known engineer, inventor, manufacturer, and merchandiser of radio apparatus. Before becoming president of the Pacent Electric Company, Inc., he was, for several years, in charge of the radio sales and manufacturing department of the Manhattan Electrical Supply Company, New York City. Mr. Pacent's contributions to radio literature have been numerous and varied.

Elmer E. Bucher, the secretary, has been active in the radio field since 1903, when he joined the De Forest Wireless Telephone and Telegraph Company as a research engineer. Four years later, he became a member of the engineering staff of the United Wireless Telegraph Company, engaging in research and experiment work in that company's laboratory. Later he was made chief inspector. He was responsible for the installation of a large number of land stations throughout the United States. At that time he began the preparation of a series of radio books that have since become standard in the amateur field. Mr. Bucher was the first man to interest the Y. M. C. A. in the teaching of radio and, as a result of his activity along this line, he joined the Marconi Wireless Telegraph Company of America, in 1913, as instructing engineer, later organizing the Marconi Institute of which he became director. He was technical editor of "Wireless Age" from 1913 to 1917. When the Marconi Wireless Telegraph Company of America was merged into the Radio Corporation of America, Mr. Bucher was appointed commercial engineer in charge of domestic and export sales and, later, was made sales manager of the company's entire merchandising activities.

Charles Gilbert, president of the De Forest Radio Telephone and Telegraph Co., is the treasurer. Mr. Gilbert joined the De Forest interests in 1915, having in his charge all of the financial and commercial affairs of that company. Before joining the De Forest Company, he was a chief certified public accountant. Although Mr. Gilbert is not an engineer he is thoroughly conversant with all the commercial and financial angles of the radio industry and his experience in this work will make his services of great value to the association as treasurer.

The following standing committees have been created to fulfill the purposes indicated by their names:

Committee on Publicity, Committee on Receiving Sets and Equipment, Committee on Aural Devices and Accessories, Committee on Spare Parts, Committee on Support of Broadcasts, and the Executive Committee.

(Continued from preceding page)

tee which is composed of the chairman and treasurer of the Radio Section and of the chairmen of the standing committees.

This is the nucleus of an organization which will eventually include every important enterprise in the radio industry.

In Support of Broadcasting

Although broadcasting stations have been established by newspapers, department stores, dealers, a few universities, and the United States Government, the public turns for its entertainment and instruction chiefly to about half a dozen stations maintained by a few enterprising broad-minded manufacturers, at their own expense. Time and time again the question has been raised. "Who is to pay for broadcasting?" When this question is satisfactorily answered broadcasting may be placed upon a sound, permanent basis. The character of programs, the qualifications of feature directors, the territory to be covered by a given broadcasting station, all these matters will be speedily disposed of when the all-important problem of supporting the broadcasting stations has been satisfactorily solved.

At present, the industry as a whole contributes nothing to the maintenance of broadcasting stations, nor does it exercise any control over the programs broadcast or the territory covered by a station. That dozens of manufacturers and hundreds of dealers who are dependent on the continued maintenance of broadcasting stations contribute nothing to broadcasting, is not to be attributed to any unwillingness on their part to keep alive the interest of the public in radio, but solely to the fact that the industry has been unorganized and that no contact has been established with the broadcasting stations. The Radio Apparatus Section of the Associated Manufacturers of Electrical Supplies has already considered this highly important matter of supporting the broadcasting stations. It is one of its chief objects to devise a plan of promoting broadcasting which will enable the individual members of the industry to contribute their just share of the expense now incurred for entertaining and instructing the public through radio. Just what plan will be adopted, it is too early as yet to predict. In all probability, a tax of some kind will be levied on the members of the Radio Apparatus Section, the amount of the levy depending upon the annual gross sales of each member.

In all probability, the members, all of whom have pledged themselves to support broadcasting by financial contributions, will be authorized to affix to their apparatus and to include in their advertisements the insignia of the association. Thus, the public will be enabled to show its preference for the apparatus made by a manufacturer who has assumed part of the financial burden of broadcasting and who accepts his responsibility to the public. Inasmuch as the Radio Apparatus Section through the proper committees, will voice its approval or disapproval of the sets made and sold, the insignia may well become a valuable trade-mark, a symbol of quality.

Explaining Policies to the Public

Because of the public utility character of broadcasting, the Radio Apparatus Section of the Associated Manufacturers of Electrical Supplies, recognizes the need of explaining the possibilities and the limitations of radio to the public, as well as its own attitude. The central stations, the electric light companies, the traction companies, telephone and telegraph companies, have all been asked to take the public into their confidence, largely under the pressure of legislative action. It is far better that radio should explain and regulate itself at the outset of its career than under compulsion. Moreover, radio is still a mystery to

general public and even to many dealers. Because it is new, it needs explaining. The policies advocated by the Radio Apparatus Section, policies which will govern the future course of the industry must be laid bare, all the more so since they will be adopted as much in the public interest as in the interest of radio itself. Hence, a committee on publicity has been appointed which is charged with this educational task.

It is evident that the scope of the work that must be done by the committee on publicity must be broad. No doubt, cooperative advertising must be undertaken to familiarize the public and the trade with broadcasting programs and broadcasting policies.

Broadcasting is now subject to more or less governmental regulation. Laws are bound to be enacted which will have a marked influence on radio. Before the Radio Apparatus Section was formed, manufacturers opposed or advocated legislation individually. Because the industry was unorganized, legislators found it difficult to determine the attitude of the radio industry and the public as a whole to the proposed laws. It would obviously be to the advantage of Congress, to radio, and to the public if the technical knowledge and experience of the Radio Apparatus Section can be applied to guide legislators. The Radio Apparatus Section plans to do what useful work it can in thus avoiding well-meant but ill-advised federal action and in recommending really necessary legislation.

Standardization of Apparatus

If we may judge by the experience of electrical and automobile manufacturers, as well as manufacturers of engineering products in general, standardization of radio apparatus must some day be undertaken. Radio is still so young and is growing with such startling rapidity that, as yet, it is inadvisable to frame any rules comparable with those that have been adopted by the standardization committees of the various engineering societies. The committee on standards will decide when the time is ripe for recommendations that should be followed by manufacturers.

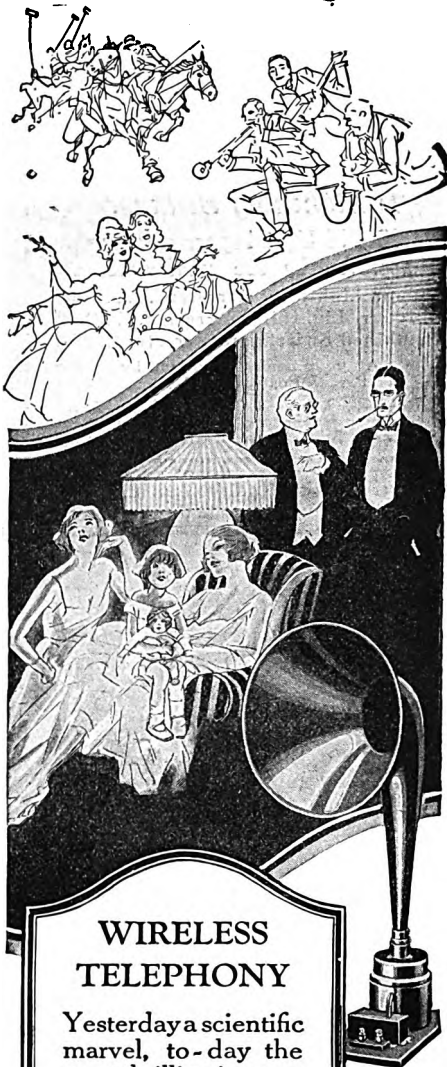
Federal Radio Activities Increasing

WASHINGTON, D. C.—Since the establishment of the Interdepartmental Radio Board, radio activities in several of the United States governmental departments and bureaus have been increasing rapidly. The Army and Navy are constantly going full tilt and increasing their official and public service almost daily, while the Post Office, with fifteen stations, is perfecting radiophone broadcasting and planning control of its cross-country air mail-planes. The Public Health Service and the Bureau of Education now expect to open broadcasting services for the dissemination of information and educational matter.

The Veterans' Bureau is broadcasting employment advertisements weekly. Secretary Davis wants a labor radio-news service. The Department of Commerce has just authorized its thirty-three co-operating offices to arrange with local broadcasting stations to release all cable and radio information on foreign markets in the form of a daily world survey.

Interesting items are expected daily concerning foreign trade and commerce, from broadcasting stations at Akron, Atlanta, Baltimore, Boston, Bridgeport, Chattanooga, Chicago, Cincinnati, Cleveland, Columbus, Dallas, Dayton, El Paso, Indianapolis, Los Angeles, Milwaukee, Newark, New Orleans, New York, Norfolk, Omaha, Pensacola, Philadelphia, Pittsburgh, Portland, Richmond, Rochester, San Francisco, St. Louis, Seattle, Syracuse and Manila.

MAGNAVOX Radio



WIRELESS TELEPHONY

Yesterday a scientific marvel, to-day the most thrilling interest and enjoyment within reach of the average American home.

In the air, day and night, superb concert and dance music, important addresses, hilarious vaudeville, world weather reports; also correct time signals being broadcasted by radio-transmitting stations in every part of the country.

Here is a new world of information, education and inspiration; an "Aladdin's" dream realized in actual fact when you install in your home any one of the many simple receiving sets with a Magnavox Radio.

The Magnavox Radio makes it possible for you to hear all that is in the air as if it were being played by your phonograph.

Any Radio dealer will demonstrate for you, or write to us for descriptive booklet and name of nearest dealer.

The Magnavox Co.
Oakland, California
N.Y. Office: 370 Seventh Ave.
Penn. Terminal Bldg.

VARIOMETERS**\$2.75****VARIO COUPLERS**

Completely Assembled—Guaranteed
The Coleman Radio Mfg. Co.
 62 High Street Springfield, Mass.

*Is Your Home Properly
 Protected?*

*Is Your Insurance Valid,
 If Lightning Strikes?*

HORNE Lightning arresters are
 approved by fire underwriters

Indoor Lightning Arrester.....\$1.00

Outdoor Lightning Arrester....\$1.50

Combined Switch and Arrester..\$2.50

At your dealer or direct by
 Parcel Post Prepaid from

Horne Manufacturing Co.

30 Church St. Dept. A. New York City

Subscribe for Radio World, \$6.00 a
 year, \$3.00 six months, \$1.50 three months.

Rocky Point Receives Regularly from Five European Stations

RADIO messages from five European stations are received regularly at the Rocky Point, Long Island station—from Carnarvon, Wales; Stavanger, Norway, the Lafayette station at Bordeaux and two German stations near Berlin. Facilities also can be made adequate at this station for the reception of wireless from the San Paula station near Rome, the new Polish Government station now being erected near Warsaw, and the proposed new Belgian station near Ghent.

Nearly ten miles of antennae at Rocky Point snatch electrical impulse out of the ether, and the messages are relayed, automatically, over seventy-five miles of land wire to the receiving operators' headquarters in the Broad Street station, New York. The messages also are recorded mechanically so that a permanent record of them is kept.

Operating on these five great wireless circuits—three more than are run into any other station on earth—the engineers are faced with the problem of keeping static down to a minimum. They have

succeeded to the point where all the circuits are kept open daily.

One method for combating static is the building of an antennae system between nine and ten miles long, pointed in the direction whence the wireless messages are received from Europe, so that the electrical impulses, on a wave length about as long as the antennae, strike the end of this stretch of wire and travel along its two strands to the station, with elimination of much of the static.

Short Waves Being Favored

BROADCASTING stations will be using a wave length of from ten to fifty meter within the next three years and wave lengths as short as 100 meters will be in use before this year comes to a close, is the prediction of a writer in "The Evening Mail Radio Review," New York. This may sound like idle speculation now, but it must be remembered that things are moving rapidly in radio. That which is a fact to-day is history to-morrow. Radio is a science in the making.

There are many things in favor of the shorter waves, although engineers up until a few months ago were willing to concede nothing along this line. The short wave was an outcast left upon the scrap-heap of radio. But like many other waste products, the short waves are beginning to hold out some possibilities. They are ideal for radiotelephony, and sharper tuning is possible with their use. If they were pressed into service, interference would be greatly reduced and there would be more freedom in the choice of wave lengths for use in broadcasting.

At one time it was thought impossible to bridge the Atlantic Ocean with short waves. Engineers thought that only the longer waves could be used for such purposes. Our radio amateurs surprised the long-wave school when they successfully bridged the Atlantic last year with their little 200-meter transmitters, using only a few watts of power. That accomplishment emphasized the possibilities of the short wave, and it brought many engineers out of a coma that had troubled them for a number of years.

Signals Heard

20Y—Connecticut

Spark: 2 KT, 2 TS, 3 HT, 3 RW, 3 ARN, 3 BKW, 4 EA, 8 BO, 8 RQ, 8 ACF, 8 AFB, 8 AJT, 8 BAZ.

3 NB, 3 XM, 3 HX, 3 ZY, 3 ALN, 3 YP, 3 GE, 3 CN, 3 TA, 3 ARM, 3 QW, 3 QR, 3 BLF, 3 BZO, 3 BZK, 3 ZO, 3 BNU, 3 GA, 3 IL, 3 UV, 3 BG, 3 BOF, 3 BIJ, 3 BEC.

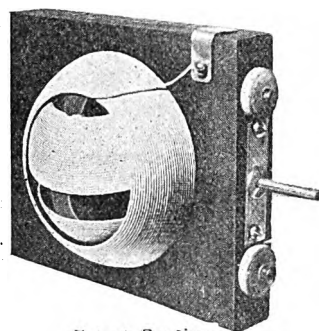
4 ABL, 4 DC, 4 BZ.

5 BM, 8 ATU, 8 XK, 8 AGZ, 8 HJ, 8 ANY, 8 SP, 8 AX, 8 AWP, 8 APL, 8 ASH, 8 AFD, 8 GW, 8 ACF, 8 AFD, 8 PX, 8 BFG, 8 CBJ, 8 LB, 8 WO, 8 AUH, 8 ZW, 8 IZ, 8 HM, 8 AFA, 8 HO, 8 TB, 8 AIT, 9 IO, 9 CU.

COMPLETE YOUR FILE OF RADIO WORLD

Copies of Radio World No. 1

If you did not get a copy of Radio World No. 1 send us \$6.00 and we will send you the paper for one year, and start it with our first issue, which will be mailed you as soon as possible after receipt of order. (Adv.)



Patent Pending

RADIOMART VARIOMETERS ARE POPULAR!

The Reasons Are Apparent!

No dielectric is used around the coils—yet they are as strong as metal. Nickel plated brass bearings. Our design is exclusive, making it the best appearing variometer on the market.

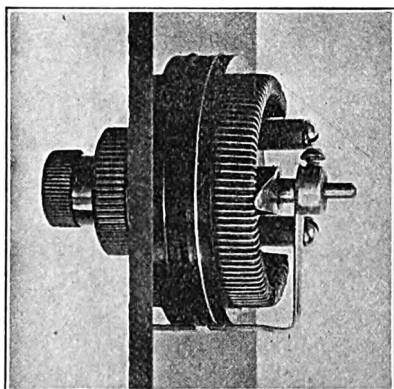
RADIOMART VARIOMETERS when used in your receiver will produce loud, clear signals and music and bring in long distance work too. Sold on money-back guarantee. Wave length, 150-600 meters.

Price, \$5.00 prepaid. Cash or C. O. D.
 Our Literature is Free! More Dealers Wanted!

RADIOMART CO. 1236 American Ave.
 Long Beach, Calif.

Improved Vernier Rheostat

An absolute necessity in the new Armstrong
 Regenerative and in Radio Frequency
 Amplification



VERNIER

With Dial\$2.00

Without Dial\$1.50

REGULAR

With Dial\$1.50

Without Dial\$1.00

We are the only manufacturers
 selling a regular rheostat with dial
 for \$1.50.

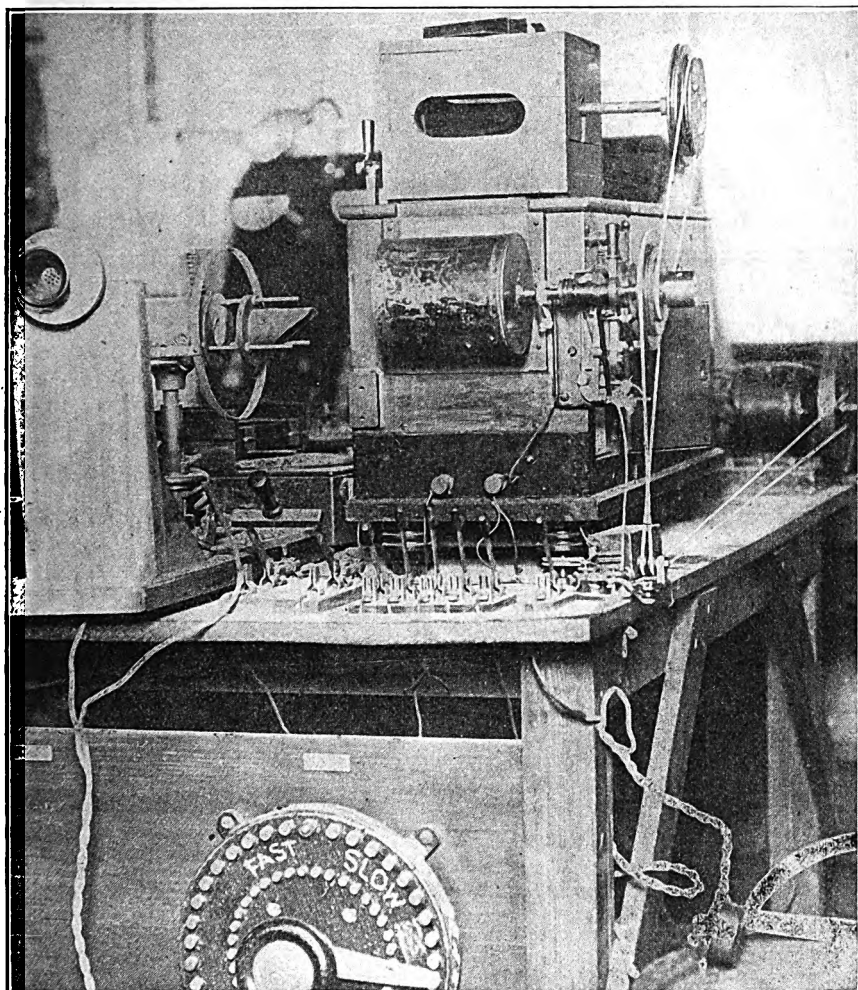
MAXIMUM DISCOUNT TO DEALERS

THE TECO RADIO CO.

P. O. Box 3362, Boston, Mass.

Factory: 165 High St., Waltham, Mass.

The Oscillograph and Its Work



(C. Central News Photo Service)

One of the most interesting pieces of radio apparatus, recently developed, is the oscillograph. Although in the experimental stage, it has proved of great merit. Its functioning is based on the principles of the moving-picture machine. Its principles are the same except that radio circuits are applied. It is used in radio stations, especially those of the transatlantic type, for the reproduction of radio signals. This enables the high-powered sending machine to be pressed into service at the transmitting station. With the aid of the oscillograph at a receiving station thousands of messages may be recorded from a distant transmitting station. With the terrific speed maintained messages are sent thousands of miles in a few seconds. The oscillograph also photographs speech waves.

Radio News Distribution

FROM long and systematic experiments the German Post Office has come to the conclusion that radio telegraph is the simplest and cheapest means of distributing news from a central point, says "Scientific American." The post office administration entered into an agreement with a news distributing agency for the circulation of market prices of stocks, prices of material and so on. Subscribers to the service pay 4,000 marks per annum to the post office for installation and maintenance and a subscription for the news service to the press agency. Reception of news services which are subscribed for is partially prevented by changing the figures which have to be decoded by the subscribers entitled to the particular service. The apparatus consists of a single-wire antenna, loop antennae not being used since they involve expensive amplifying receivers. A single-tube receiver is supplied, supplemented where necessary by two audio-frequency amplifying tubes, while filament and plate currents are taken from the mains through suitable resistances.

Fifty-two issues for \$6.00. Sub. Department, Radio World, 1493 Broadway N. Y. C.

RADIO MAILING LISTS

We have just compiled a list of
6000 Retail Radio Dealers, covering the United States, price per M.....\$7.50
707 Radio Manufacturers, price per List.....7.50
726 Radio Supply Jobbers, price per List.....7.50
280 Owners of Radio Stations, price per List 4.00
14000 Radio Amateurs and Managers of Radio Stations, price per M.....7.50
Remit with order
TRADE CIRCULAR ADDRESSING CO.
166 W. Adams St., Chicago, Ill. Phone Franklin 1183

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By JAMES R. CAMERON

HOW TO BUILD YOUR OWN RADIO SET \$.25
RADIO DIRECTORY..... .50
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Buy them to-day from your dealer or direct from

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139 WEST 42nd STREET NEW YORK

Learn to Receive Code Messages
Standard Regulation U. S. Army

Field Message Book

Purchased from Signal Corps, U. S. A.
Pocket Size: 4 1/4 x 6 1/4. Cloth Bound, Hard Board Cover. 104 Pages.

CONTAINING:

MORSE CODE SEMAPHORE CODE
INTERNATIONAL CODE

Carbons and Blanks for receiving, etc.

MAILED
POSTPAID 20c.

ACORN TRADING CO., Inc.
342 Madison Avenue New York City

"MIRAD"

"Quality Radio Priced Right"

3 Plate Variable Condensers..... \$1.50
Mirad Varicouplers..... 3.75
3000 Ohm Double Head Phones..... 6.00
1500 Ohm Single Head Phone..... 3.00
(Money back guarantee.)
Mirad Detector Unit..... 30.00
Mirad Two-Step Amplifier..... 25.00

Postage Paid
Dealers' Sample of Above 25% Off

Miracle Radio Mfg. Co.
Interurban Bldg., Dallas, Texas

Latest broadcasting map 15c. That is, a complete broadcasting map appeared in Radio World, No. 8, dated May 20. Mailed on receipt of 15c. Radio World Company, 1493 Broadway, N. Y. C.

SUPER-REGENERATION

cannot be accomplished without certain fixed inductance values.

We have for immediate delivery:

5 M. H. Choke Coils - - - - \$2.50
100 M. H. Choke Coils - - - - \$3.00
12000 Ohm Resistances - - - - \$3.00
.005 MFD Tested Condensers - - 75c

The above parts have been tested in our Demonstrating Set, using the

ARMSTRONG CIRCUIT

and are known to be of correct value.

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Radio Engineers

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Advertising Rates, Display, \$5.00 per inch, \$150.00 per page

Radio Merchandising

Classified Quick-Action Advertisements, 5 cents per word

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Let Radio World Test Your Goods

Manufacturers, send a sample of your goods to our Technical Editor, Fred Charles Ehlert, 9006 Pleasant Street, Queens, Long Island, N. Y. It will be carefully tested and returned. If your goods satisfy our experts, RADIO WORLD'S endorsement will be published in our merchandise department without charge or obligation of any kind on your part.

Rusonite Detector

Radio Chemical Co., 1361 Fortieth St., Brooklyn, N. Y.

A CHEMICAL crystal which comes in a small can nicely made up with a copper-whisker wire to be used for contact. A sample of this crystal termed "Rusonite," was tested out in a single circuit and a two-circuit receiver. The surface was uniform in sensitivity. It is mounted in an alloy ready to be used in the cup of a crystal holder.

Passed the test of RADIO WORLD'S experts and awarded letter of excellency.

* * *

23-Plate Variable Condenser

National Radio Co., 50 Union Square, New York City.

A WELL - CONSTRUCTED condenser of 23 plates. Capacity .005 mfd. stationary plates firmly held in machined pillars. All burrs have been removed. This reduces the leakage effect when using them in conjunction with C-W transmitters. The rotary plates fit into machined slots on the shaft and are pinned by a special method. Contact is made with shaft through a spring member which can be adjusted by a screw at the base of the condenser. The insulating ends resembles radioplate. Means are provided also for holding the condenser to panel or testing board. Tests on this condenser show that its manufacturer has made every effort to produce an honest product.

Passed the test of RADIO WORLD'S experts and awarded letter of excellency.

A Variable Condenser

Pioneer Radio Products Co., 329 East Twenty-ninth St., New York City.

A 23-PLATE variable condenser of good construction. The plates, which are punched, are mounted between aluminum bushings. The shaft of the movable plates is of copper well mounted with a copper contact arrangement. Insulating material resembling radioplate makes up the end plates of the condenser. All burrs are removed from sharp corners, thereby preventing leakage when used in conjunction with C-W transformers. The capacity of the condenser was found to be .0005 mfd.

Passed the test of RADIO WORLD'S experts and awarded letter of excellency.

* * *

Uses Bakelite End Plates

United Manufacturing and Distributing Co., 536 Lake Shore Drive, Chicago, Ill.

A 23-PLATE variable condenser of good construction. Bakelite end-plates are used with inserted brass bearings. The shaft of the moving plates is of brass with brass plate separators. Plates are of aluminum properly finished, with round etchings throughout. Proper facilities are made for connections. All parts finished in nickel. All burrs are removed from the edges of plates and sharp corners have been rounded off. In the event of this condenser being used in connection with C-W transformers, leakage is reduced to a minimum. The capacity was found to be .0005 mfd.

Passed the test of RADIO WORLD'S experts and awarded letter of excellency.

* * *

Radio-Duct, the New Conductor for Wiring Receiving Sets

RADIO-DUCT



IT has been established in radio engineering, just as in electrical engineering, that conductors of electricity—herein we specifically refer to copper wire and regular commercial conductors—when placed at right angles to each other and electrically charged, one will not influence the other; each will maintain its own resultant magnetic field and no induction will be set up. On this principle, Radio-duct has been developed.

This new conductor is self-shielded which permits it to be run parallel or angular in the set, connecting part to part, transmitting the intended current acceptedly without loss or change. This is accomplished by a two-circuit conduction, each circuit independent of the other. The main conductor consisting of copper wire, enameled cover, serves as the trunk in transmitting the intended current from part to part

Radio Business Brisk in Northwest

EDITOR RADIO WORLD: You may enter the following data in your "New Firms and Corporations" column, if you will:

Intercity-Marine Wireless Electric Co., Inc., Radio Jobbers, Contractors, Manufacturers. Capital stock \$100,000. Incorporated 1921. 83 Columbia Street, Seattle, Wash.

We are interested in securing exclusive representation of radio lines, particularly radio hardware and small parts of all kinds. If you can put us in touch with responsible people who are manufacturing such equipment we believe you will be doing both them and ourselves a favor. We desire to communicate only with bona-fide manufacturers who can give us a proposition which will enable us to sell the jobber and dealer on a reasonable basis. We carry six radio salesmen who make the territory of Alaska, Western Canada, Washington and Oregon. We are covering this territory thoroughly and can give any desirable apparatus a fair show.

Our sales record during the summer has been remarkable, and we feel that we can sell more of any firm's products through the personal call than can be disposed of by circularizing from the East.

For the interest of your readers, we might say that radio business in Alaska is rapidly picking up. They did not get in on the broadcasts to any extent last year; but, this winter, they will have a broadcaster at Juneau and one at Nome. Indications are for a big year in the North. Western Canada practically dropped out of radio during the summer and is not picking up as fast as Washington and Oregon. Oregon, today, has a large number of broadcasters, and there has been a healthy demand for radio apparatus in the Willamette Valley during the summer. Portland dealers have not noticed the summer slack as have the dealers in Seattle, Washington, where it was quite noticeable.

INTERCITY MARINE WIRELESS ELECTRIC CO., 83 Columbia Street, Seattle, Wash.

By John C. Mitchell, President-Manager. July 21, 1922.

in the set. Virtually, without any loss or change, this is accomplished by the shield (spiral) winding which is placed over the entire periphery of the main conductor. This shield winding consists of many turns of small-sized copper wire, enameled covered, wound two-in-hand, each turn is snug up to the other, and this winding (called the shield winding) accomplishes the purity of conduction in the main conductor by collecting or taking the stray currents—that is: ethereal eddy currents or static building up within the set—and neutralizing these pests within its circuit.

It may be seen by consulting the drawing that the lines of force created by the shield winding across the lines of force of the main conductor at right angles. This will not permit electrical influences to bother the main conductor in its work. So, with a "pure" conductor in the receiving set, reception is free of noises and the audibility is very distinct, mel-low, and clear.

New Firms and Corporations

Notices in this department are considered as purely interesting trade news and published without compensation to us. We welcome trade news of this nature. All notices having an advertising angle are referred to our Advertising Department, and are placed under Classified Advertising at 5 cents a word, or as Display Advertising at \$5 an inch.

(The firms and corporations mentioned in these columns can be reached by communicating with the attorneys, whose addresses are given whenever possible.)

Radio Export Corp., Manhattan, \$10,000; J. Kuris, G. T. Baum, S. Edelson. (Attorney, M. Joondeph, 44 Court St., Brooklyn, N. Y.)

Reddi Radio Corp., Manhattan, \$10,000; I. Lecker, H. Birkmiller, L. Braff. (Attorney, C. Fay, 15 Park Row, N. Y.)

Wagner Electric Corp., Wilmington, Del., apparatus and machinery, \$11,000,000. (Corporation Trust Co. of America.)

Echo Radio Corp., Wilmington, Del., apparatus, \$250,000. (Corporation Trust Co. of America.)

Prima Radio Corp., New York, radio, \$1,000,000. (United States Corporation Co.)

The Pennsylvania Radio Corp., New York, has increased its capital from \$1,000,000 to \$2,000,000.

Radio Construction & Supply Co., Willard, Ohio. Haldon V. Cole, sales manager.

Harold M. Schwab, Manhattan, radio equipment, \$25,000; H. M. and F. L. Schwab, A. Fischer. (Attorney, R. Kent, Jr., 154 Nassau St., New York.)

Lewal Service Company, manufacturers of radio cabinets, 565 Fifth Ave., New York City, N. Y.

Coming Events

The editors of RADIO WORLD will gladly publish news items of all contemplated radio shows and expositions. Keep us posted by mailing full information.

ANNUAL SHOW OF THE ST. LOUIS RADIO ASSOCIATION, St. Louis, Mo., October 4 to 7, inclusive.

CHICAGO RADIO SHOW, Coliseum, Chicago, Ill., October 4 to 22. U. J. Hermann, managing director, 549 McCormick Building.

INTERNATIONAL RADIO EXPOSITION, Grand Central Palace, New York, December 21 to 30.

KANSAS RADIO EXPOSITION will be held at the Kansas State Fair, Hutchinson, Kansas, September 16 to 22 inclusive. A. L. Sponaler, secretary.

MERCHANTS' COOPERATIVE ADVERTISING AGENCY RADIO SHOW, Robert Treat Hotel, Newark, N. J., October 4 to 7, inclusive.

"RADIO DAY," Pittsburgh, Westview Park, August 24. Under auspices of Radio Engineering Society. C. E. Urban, secretary.

RADIO CLUB OF AMERICA. First autumn meeting will be held the last Friday in September. Renville H. McCann, secretary, Columbia University, New York.

CLEVELAND RADIO AND ELECTRICAL EXPOSITION, Cleveland Public Auditorium, Cleveland, O., August 28 to September 4, inclusive.

CINCINNATI RADIO-AND-ELECTRICAL EXPOSITION, Music Hall, Cincinnati, O., October 2 to 7, inclusive.

No Free List

RADIO WORLD has no free list. The only copies sent out by the publishers are to fill the ever-increasing orders of the American News Company, the large numbers of subscription orders received at the office of publication, and one voucher copy to each advertiser and advertising agent represented in current issues.

RADIO WORLD, 1493 Broadway, N. Y.

Last-Minute Radio News!

*Important Items Tuned in by Radio World Reporters
Just Before Going to Press*

IT is estimated that over 800,000 radio fans enlisted in a search in New Jersey and nearby States for three escaped prisoners from the Monmouth County Jail at Freehold. WJZ sent out a complete description of the prisoners. This aerial alarm was picked up in the Far West. The men were caught.

Guglielmo Marconi reports that a quartz-vacuum tube of high power is being constructed in England. It will put 75 kilowatts in an aerial.

A radio message, dated July 27, has been received at Portland, Me., stating that all the members of the arctic expedition headed by Donald B. McMillan, spent the winter in Southwestern Baffin Land and had met with much success in its observations in terrestrial magnetism.

The one hundred and thirty-second anniversary of the United States Coast Guard was celebrated by a message of praise and congratulation broadcast by the Navy Department from Anacostia.

Radio World, last week, received annual subscriptions from Ernest Paul, Prague III, Pinci II, Czechoslovakia, and Czechoslovak & American Corp., Ulice Karoliny, Svelte 4, Prague, Czechoslovakia.

Reuter's Trade Service states that the radiotelephone circuit between Copenhagen and Bornholm was recently opened to the public. The arc system is used for transmission and the rates charged are lower than for similar service by telegraph. This is the first public radiotelephone circuit to be placed in service in Scandinavia.

A musical program will be given between 11:00 A. M. and 12:00 M. and 4:30 P. M. and 5:30 P. M. week days over the new radio broadcasting station WBAY, which was recently erected on the Walker Street building of the American Telephone & Telegraph Company. A program will also be given on Thursday evenings from 7:30 P. M. to midnight, to be later announced.

July showed a gain in the value of radio shares. Many preparations are being made to float new radio concerns this fall and winter and investing promises to be brisk. Mr. Reynolds, of the Reynolds Spring Company, whose stocks is now held around \$45 a share, says that he expects big developments in radio this year.

New York's New Broadcaster Metropolis to Have Largest Station on Atlantic Coast. Better and More Attractive Programs Will Be the Result

NEW YORK CITY is to have another broadcasting station, to take the place of WJZ, Newark, New Jersey, which is to be discontinued.

The new station will be erected on the Aeolian Building, 42nd Street, between Fifth and Sixth Avenues, the heart of the busiest section of the metropolis.

This will give New York City, when all are completed, three of the largest broadcasting stations in the United States. The other two are those of the American Telephone and Telegraph Company, the one to be operated by the City of New York, now under construction in the Municipal Building. Besides these three, are the stations of John Wanamaker and Bedloe's Island.

The new station on 42nd Street will be particularly accessible for artists, which should mean a great deal to broadcasting. Inasmuch as those who talk and sing and tell stories for the vast army of amateur receivers

do so gratis, it is to be commended that they will not have to journey beyond the heart of New York City in order to give their services.

The new station in Aeolian Hall, RADIO WORLD is informed, will be one of the most complete and best-equipped in the world. It should be hailed with delight by all radio fans within broadcasting range of New York, for it means increased and more varied programs.

Working jointly, the Radio Corporation of America, Westinghouse, and General Electric, plans have been made so the transmitting apparatus will be erected on the roof of Aeolian Hall, but will be operated by means of "remote control system" from offices on a lower floor.

When the license is granted by the Department of Commerce, this station will employ two or more wave lengths which may be utilized without interference from the same aerial system in order that different concerts may be transmitted.

**GUARANTEED
RADIO SETS & ACCESSORIES
NORTHERN RADIO SUPPLY
CO., Inc.
14-16 Church Street, New York
Mail orders promptly attended to**

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BETTER THAN GALENA
The most sensitive mineral rectifier known. Can also be used with one or more stages of amplification.
Mounted, 35c.; Unmounted, 20c.; Postpaid
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Apply for Special Trade Prices
Rocky Mountain Radio Products, Inc.
9 CHURCH ST., NEW YORK, N. Y.

Radio Trade Directory

**National CARD CATALOG of
Radio Dealers, Distributors,
Jobbers, Indicating Class as
Exclusive, Wholesale, etc.**

Compiled from Information Secured from
Chambers of Commerce, Manufacturers, etc.

Circular and Sample Cards upon Request.

**SYDELL'S RADIO DIRECTORY
AND SERVICE**

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No Aerial No Loop
No Lamp Socket Attachment

ONLY—

RADIO-DUCT

—AND A GROUND CONNECTION

Sold in 10-Foot Rolls

At \$1.00 per Roll

IF YOUR DEALER HAS NOT
GOT IT WE WILL SHIP
DIRECT UPON RECEIPT OF
YOUR REMITTANCE.

Columbia Electric Motor Co.

1414 ADAMS STREET
HOBOKEN NEW JERSEY
Telephone: 3731 Hoboken

NOVO "B" BATTERIES FOR RADIO

22½-45 & 105 VOLTS



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DEPENDABLE
GUARANTEED**

ASK YOUR DEALER

NOVO MANUFACTURING CO.

424-436 W. 33rd ST.
NEW YORK

531 SO. DEARBORN ST., CHICAGO.

Great Heights for Aerials Unnecessary

AS a general rule, the higher a transmitting aerial the greater distance it will cover, says "The Globe," New York, but for short waves another thing must be taken into consideration and that is the matter of capacity. If the aerial is very high the horizontal portion will necessarily be short in order to come within the required wave-length limit, and, therefore, the capacity and the radiation resistance will be lower than that permissible for maximum efficiency. This factor does not enter into the design of aerials for long wave stations, but these are limited almost entirely by expense and constructional difficulties.

With receiving sets, the height of the aerial does not necessarily determine its effectiveness. Where there are low buildings and few surrounding obstructions, a height of twenty feet is plenty sufficient. Thirty to forty feet is good enough for most any location, except where you are surrounded by skyscrapers or abrupt hills or mountains. In all cases it is well to remember that great height for a receiving aerial is unnecessary. Just try and have it a little higher than the surrounding buildings. When this is not altogether possible, try and make it as nearly so as you can.

Care Regarding Patents

AS the Patent Office must grant a patent to one who produces a new and useful invention—no matter how many prior patents may be infringing thereby—it follows that it is not safe to assume, as many do, that the receipt of a patent from the United States Government gives the owner thereof the right to manufacture, use and sell devices embodying the invention of the patent. Much litigation results from the failure of manufacturers to know before they begin the manufacture and sale of a device, whether they have the right to do so, and the failure to observe the warning contained in the slogan, "Be sure you are right—then go ahead."

There are many United States patents for radio apparatus. They are in large measure extremely technical and obtuse. We venture to say that the average manufacturer who is now embarking upon the manufacture of such apparatus would not be able to understand such a patent if laid before him, and yet he takes a chance of great financial loss by going ahead.

With regard to one radio patent which has recently been before the courts, it has been decided that the inventor made a real invention, much broader than he or the one who prepared the patent was aware of, and as a consequence many devices are being manufactured and sold which will ultimately be found to be an infringement of that patent. Some manufacturers of radio apparatus know of that patent, and in a vague way they know what the courts have done in sustaining that patent. The patent covers a well-known so-called reamplifying receiving set. This is made up of various parts. It is surprising to learn how many believe that while they cannot make and sell the entire apparatus without infringing, they nevertheless have the right to make and sell the various parts of which it is made, and to sell such parts all ready to be assembled. The fact is, however, that one who makes and sells the parts of a patented apparatus, knowing that they are to be used for the production of that apparatus, is just as guilty of infringement as the one who makes and sells a complete assemblage of parts.—"Scientific American."

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5,000 Amateur and other owners radio apparatus 10.00
25,000 Amateur and other owners radio apparatus 40.00
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Amateur Radio Directory of the U. S. Complete list of Amateur stations with names and addresses of operators or owners. Priced for \$3.00

Names and addresses are guaranteed 95% correct will refund postage on all mail returned as undeliverable if less than 98%. Remit with order.

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1021 Carrington St. Janesville, Wis.

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VARIABLE CONDENSER

MONEY-SAVING PRICES

An accurately made, fully efficient instrument that cannot get out of order or adjustment. Fully guaranteed. Extra heavy aluminum plates. Condensate end pieces. All other parts heavily nickel-plated. Knob and pointer included. Furnished assembled or knocked-down at the following low prices. Easily assembled by anyone following instructions furnished. Save money—order from us. Folder upon request.



No. of Plates	M.F.D. Capacity	Assembled	Knocked-down
3	.00007	\$1.75	\$1.50
11	.00025	\$2.50	\$2.00
21	.0005	\$3.25	\$2.50
43	.001	\$3.90	\$2.90

Lott's Better Radio Condenser Co.
473 ORANGE STREET NEWARK, N. J.

For Finer Tuning Use a



**Every-Wire-Contact Coupler
LIST \$7.50**

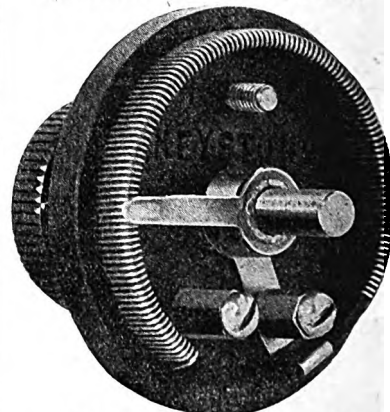
Write for Pamphlet

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30 OGDEN ST.

Newark New Jersey

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KEYSTONE FILAMENT RHEOSTAT



**RESISTANCE 6 OHMS.
CARRYING CAP., 1½ AMPS.
LIST PRICE, \$1.00**

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Wire or Write for Discounts.

Immediate Delivery

Manufactured by

Keystone Radio Company
Dept. W. GREENVILLE, PENN.

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TELEPHONE, BRYANT 4798
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subscription order.

Advertising rates on request.

Entered as second-class matter, March 28, 1922,
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the act of March 3, 1879.

IMPORTANT NOTICE:

While every possible care is taken to state
correctly matters of fact and opinion in technical
and general writings covering the radio field, and
every line printed is gone over with a scrupulous
regard for the facts, the publisher disclaims any
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out of technical problems, or other matters that
may be printed in good faith and on information
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This statement is made in good faith and to save
time and controversy in matters over which the
publisher cannot possibly have control.

School Boys Ambitious to Build Sets

ELIZABETH, New Jersey, was among
the first places to encourage boys in
building radio sets, and thus far 251 sets
have been made in the manual arts depart-
ments of the grammar schools. More than
100 sets have been made by the boys in the
vocational schools. One hundred and fifty
sets have already been completed by gram-
mar school boys in Hasbrouck Heights.

In the schools of West New York the
study of radio has been carried on in the
mechanical drawing department. Very effi-
cient drawings have been developed and used
by the boys while building their wireless
sets. There have been made, so far, 131
sets. The Plainfield public schools have
given considerable thought to the study of
wireless and more than 110 sets have been
made by grammar and high school boys.

Interest in this project has been encour-
aged in places quite close to broadcasting
stations, and in virtually all of the school
shops, of the Newark public schools one may
see boys working on wireless sets. More

than 500 sets have been completed by the
boys during their manual training period.
Kearney and Nutley public schools have
given their boys an opportunity to use the
manual training departments for the con-
struction of radio sets, and report that
nearly 300 sets have been completed.

Recently a radio show was held in Pater-
son, and a vacuum tube set which had been
built in Grammar School No. 6 won first
prize. Reports from other districts through-
out the State indicate that during this school
year more than 4,000 wireless sets have been
made in school shops of the New Jersey
public schools.

Radio in Great Britain

FROM Mr. W. H. Smith of the editorial
staff of the "Illustrated London
News," we have received a most inter-
esting letter in which he writes, in part:
"Although the British daily papers have
been booming radio day by day since the
beginning of April, and the public has
responded magnificently, there is at pres-
ent very little to 'listen in' to. Every
Sunday, 2-5 p. m., Dutch concert from
the Hague, 1,070 meters. Every Sunday,
about 3-4 p. m., Paris concert, consisting
of songs and speech, 2,600 meters. Every
Tuesday, 8-8:30 p. m., Marconi concert,
400 meters. Nearly every night, 9-9:30,
unofficial broadcast test, consisting of
four or five gramophone records, trans-
mitted by Burndep, of Blackheath, Lon-
don, 400 meters. Being only four miles
away, I get these very strong on one
valve. Most evenings, 8-11 p. m., a few
amateurs talking 'tests' and sometimes an
occasional gramophone record. So far as
the Dutch concert and Paris are con-
cerned, these only just come in on one
valve, and not at all on a crystal, so that
the greater majority of wireless begin-
ners, that is to say, those who have bought
sets owing to the daily booming of the
press, don't get much at present for their
outlay, unless they happen to be rich and
can afford the four-valve sets, costing
fifty pounds or more. In the meantime,
all of the wireless firms are flooded out
with orders for receiving apparatus and
parts, but, at the present moment, for
some reason or other, they are hanging
up their arrangements for broadcasting,
which, unless something is done, and
done quickly, will react on them. Nat-
urally, once in possession of the means
for getting the broadcasts, we want to
know times and programmes, especially
after business hours; otherwise one
might listen all day and night to nothing
but ships' Morse, and C. W. from the
big stations. So, at the present moment,
we are 'all dressed up, and nowhere to
go.' However, a few gentle hints from
the daily press are now being started,
so things may buck up in the near
future."—"Scientific American"

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"EVERYTHING IN INSULATION"
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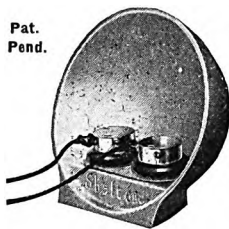
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Yours truly,

(Signed) David J. Farley, Times Bldg., Newsstand.

Answers to Readers

IN RADIO WORLD, No. 16, dated July 15, you have an article on assembling a detector and two-stage amplifier. You also publish a list of material required. Can you tell me where the three jacks go and, also, why it is necessary to use them? Are the jacks used in this circuit of the open or closed type? Where does the variable condenser go that has a capacity of .001 mfd? What is the resistance of the phones to be used in this circuit?—Barney Walpert, Richmond, Va.

The jacks are used for the convenience of cutting in any amount of stages of amplification desired. They are connected between the plate circuit and grid circuits of the tubes used. The jacks used are as follows: 2 of the two circuit type and 1 of the open-circuit type, for this set. The variable condenser is connected in series with the antenna circuit. The resistance of the phones may be between 1,000 and 2,000 ohms.

Publish a hook-up of a two-stage amplifier. Show the necessary jacks in diagram?—Letter unsigned, Fairmount, W. Va.

This problem was fully explained in RADIO WORLD No. 14, dated July 1, in an article entitled Novel Unit-Detector and Amplifier, by Frederick J. Rumford. He describes and illustrates just what you are seeking.

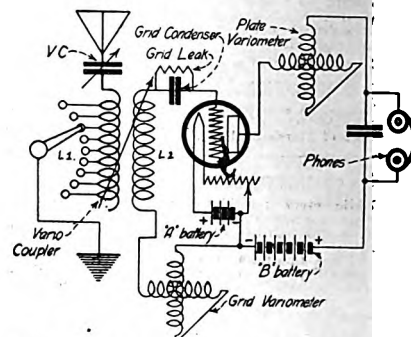
What distance may be received with the set described by H. S. Stanford in RADIO WORLD, No. 16, dated July 15?—S. T. Bortoff, 112 North Olympia St., Tulsa, Oklahoma.

This depends on the builder. If the

assembly of the set is wired up correctly, some hundred of miles could be covered provided weather conditions are such that the static interference is practically eliminated.

* * *

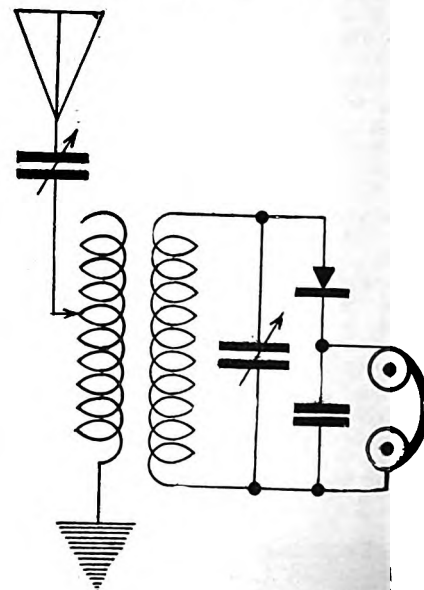
Show a diagram and hook-up of a single-tube set, employing two variometers in the circuit. Show the taps on the primary and position of the batteries used.—Paul Mohap, Yonkers, New York.



The above diagram shows the necessary data for making the regenerative set. Follow each connection with great care.

* * *

I am sending several hook-ups of my radio set. I have used them all and it seems that all I hear is code. Although I live only eight miles from WGR, Buffalo, I cannot hear any of the concerts. Why is this? I am using a crystal detector and 2,000-ohm phones.—Richard Palmer, Blasdell, New York.



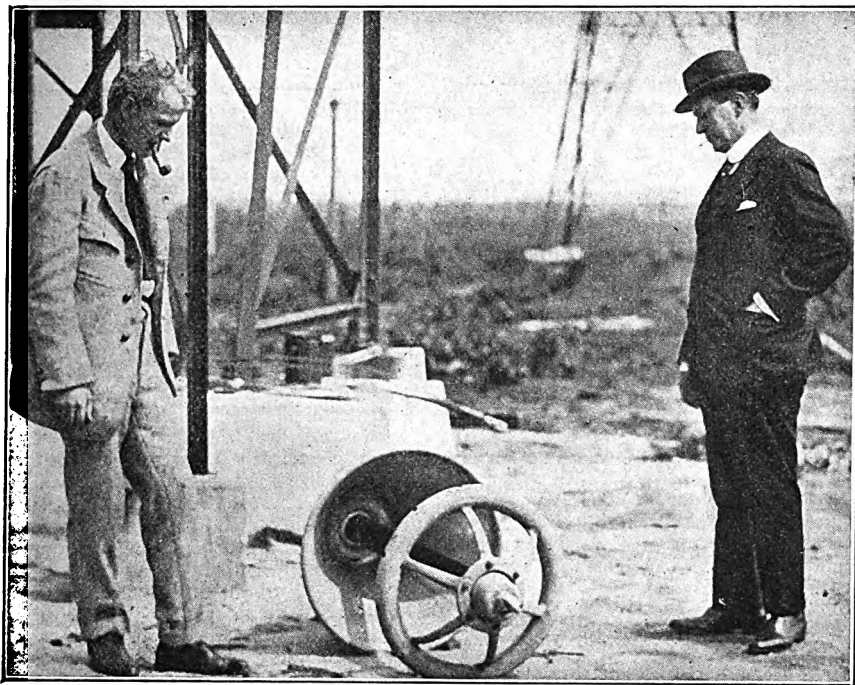
The accompanying sketch will show you proper connections for your set. Probably you are right about your crystal. Always have a few good tested crystals on hand. Look carefully over your wiring and lead-in from antenna. Inspect your telephones.

* * *

Give me the addresses of manufacturers of radio frequency transformers?—O. N. Williams, Albany, N. Y.

As radio frequency is in its infancy, there are few manufacturers who are turning out transformers. We refer you to the Radio Instrument Co., Washington, D. C.

Necessary to High Voltage



(C. Central News.)

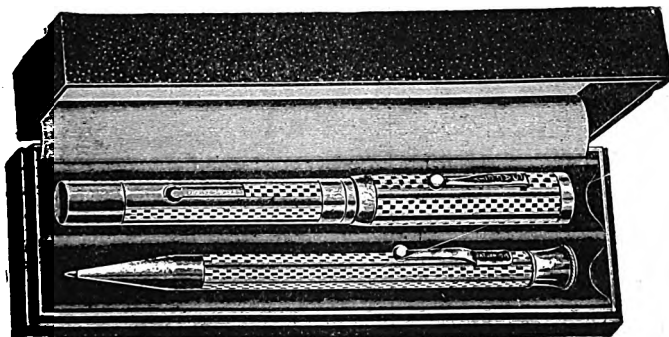
One of the most useful instruments in radio communication is the insulator. When huge masses of high voltage are used it is of utmost importance that every particle of energy be utilized. To accomplish this it is necessary to have the proper insulating devices to carry such high voltage without leakage or breakdown. This is an important factor, especially when thousands of miles must be covered to establish and maintain communication. In the above photograph Guglielmo Marconi and Roy G. Weagant, consulting engineer of the Radio Corporation of America, are inspecting an insulator used at the most powerful station in America—at Rocky Point, Long Island, New York.

The Human Side of Marconi

MARCONI'S humor was displayed when he met Dr. Charles P. Steinmetz, the noted electrical engineer, at the General Electric plant at Schenectady—the first meeting of these two masters of electricity in several years, says "The Times," New York. It might have been expected that when these two minds met the remarks would be on some great electrical problem of the age, but the actual conversation was on the state of health of the reptile zoo formerly maintained by Dr. Steinmetz at Schenectady. "How's the gila monster, Doctor?" asked Marconi, with that smile that always presages one of his sallies. "He's dead," replied the noted scientist. "He was too lazy to eat, and the alligator ran away." "That's too bad," said Marconi. "Now you'll have to go to work." That is only one flash of the lighter side of the man who is one of the elec-

trical wizards of the age, and whose name will go down through all history as the inventor of the first system of wireless communication. In this mood he is as quiet and modest as in his scientific discussions, and one of the most noticeable points about the great Marconi is that he rarely uses the personal pronoun, either in his humorous stories or in his scientific discussions. He has a low-pitched voice and he talks slowly, with no show of the egoism sometimes displayed by men of great achievements or attainments. His laugh also is low and contagious, because behind this great figure in the scientific world is a great human personality that exerts itself in the same way under all conditions.

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A 500-Mile Radiophone Employing a 5-Watt Tube, by Frank A. Hahnel.
"Tell Me, Please, How Will This Set Receive?" by E. L. Bragdon.
Short Cuts in Receiver-Circuit Design, by O. C. Roos.
Making a Short-Wave Regenerator, by Fred Chas. Ehler.

APRIL 8.

Do You Know Your Receiving Equipment, by James D. Gordon.
Why a Crystal Is Called a Rectifier, by Walter Emmett.
Is Radiotelephony Dependable? by O. C. Roos.
Mounting Crystals in Your Detector, by E. L. Bragdon.
Storage Batteries for Radio, by Fred Chas. Ehler.

APRIL 15.

First Principles of Electricity as Applied to Radio, by John P. Miles.
Your Storage Battery, by E. L. Bragdon.
What Makes Radio Possible, by Edward Linwood.
Ground Connection as Vital as Antenna, by Fred Chas. Ehler.

APRIL 22.

Solving the Puzzle of the Honeycomb, by Fred Chas. Ehler.
More About Your Storage Battery, by E. L. Bragdon.
Vacuum Tubes as Applied to Receivers, by Walter J. Howell.
How to Build the Loose Coupler and the Variometer, by Frederick J. Rumford.
The Best Aerial for a Receiving Station, by Edward Linwood.

APRIL 29.

Valuable Pointers on Aerial Construction, by Edward Linwood.
What is Meant by Tuning, by E. L. Bragdon.
Radio-Frequency Amplification and Regeneration, by Frank Armstrong.
Honey-Comb Coils and Condensers, by Edward Linwood.
Charging the Storage Battery, by E. L. Bragdon.
How to Construct the Variocoupler, by Frederick J. Rumford.

MAY 6.

The Advantages of Radio Frequency, by Harold S. Potter.
How to Construct, Protect and Operate a Storage Battery, by George W. May.
The Beginner's Catechism, by Edward Linwood.

Tuning and What Is Meant by It, by Fred Chas. Ehler.
New Frequency Amplifier Brings Faintest Waves in Strong, by G. W. May.

MAY 13.

My Practical V. T. Detector and Two Stage Amplifier, by Frederick J. Rumford.
The Principles of Radiotelegraphy, by Walter J. Howell.
The Reason for the Loop Aerial, by George W. May.
Tuning and What Is Meant by It, by E. L. Bragdon.
The Beginner's Catechism, by Edward Linwood.

MAY 20.

The Design of an Amateur Receiving Set, by C. White.
The B Battery and the Plate Current, by George W. May.
Radio Terms at a Glance, by Fred Chas. Ehler.
The Beginner's Catechism, by Edward Linwood.
Fire Undewriters' Rules, by Fred Chas. Ehler.

MAY 27.

The Beginner's Catechism, by Edward Linwood.
How to Make Your Own Condenser, by George W. May.
Tuning as Applied to Telegraphy, by Walter J. Howell.
Why the Condenser Doesn't Condense, by E. L. Bragdon.
Making Signals Louder with Two-Stage Amplifier, by George W. May.

JUNE 3.

The Cost of a Single-Circuit Receiver, by Howell W. Miller.
The Beginner's Catechism, by Edward Linwood.
How to Compute and Build a Fixed Condenser, by E. L. Bragdon.
Design for an Amateur's Receiving Set, by C. White.
Simple Method of Recharging a Storage Battery, by John Grayson.

JUNE 10.

Radio Receiver for Short Waves, by George W. May.
How to Filter Atmospheric Conditions, by C. White.
The Messenger Boys of Broadcasting, by E. L. Bragdon.

Are You a Member of the N. O. D. C.? by E. L. Bragdon.
The Beginner's Catechism, by Edward Linwood.
How to Construct One- and Two-Slide Tuning Coils, by George W. May.

JUNE 17.

The Vacuum Bulb's Start in Life, by C. White.
How to Select the Right Set, by E. L. Bragdon.
The Beginner's Catechism, by Edward Linwood.
Test of Inductance Coils, by Fred Chas. Ehler.
Short Waves from a Simple Receiver, by Stanley Bryant.

JUNE 24.

How to Make Your Radio Cabinets, by W. S. Standiford.
How the Crystal Detector Is Used to the Best Advantage, by C. J. Williams.
How to Construct a Long-Wave Regenerative Receiver, by George W. May.
Tested Invention of Major Armstrong Amplifies Set 100,000 Times, by John Kent.
Repairing Cracks in Hard-Rubber Storage Battery Jars, by W. S. Standiford.
The Beginner's Catechism, by Edward Linwood.

JULY 1.

Novel Unit-Detector and Amplifier, by Frederick J. Rumford.
Why You Must Use a Condenser, by C. J. Williams.
How Wave Lengths Travel, by Fred Chas. Ehler.
Radio World's Revised Dictionary, by Fred Chas. Ehler.
The Beginner's Catechism, by Edward Linwood.
Use of the Vacuum Tube Detector, by George W. May.

JULY 8.

Radio's Place in the Phenomena of Nature, by E. L. Bragdon.
The Function of the Loose Coupler, by Charles H. Plath.
Armstrong's Superregenerative Amplifier Fully Explained, by John Kent.
Operating a Transatlantic Station, by Fred Chas. Ehler.
The Beginner's Catechism, by Edward Linwood.
Reducing Strays and Statics, by Fred Chas. Ehler.

JULY 15.

Assembling a Detector and Two-Stage Amplifier, by H. S. Standiford.
Combined Radio and Audio Frequency Amplification, by C. White.
The Beginner's Catechism, by Edward Linwood.
Locating Your Aerial, by Harold Day.
Facts for Beginners, by Fred Chas. Ehler.

JULY 22.

When Your "Movies" Come by Radio, by Stanley Bryant.
Underlying Principles of the Vacuum Tube, by George W. May.
Practical V-T Detector Panel, by Frederick J. Rumford.
Revised Radio Dictionary, by Fred Chas. Ehler.
The Beginner's Catechism, by Edward Linwood.
Importance of Aerials to Radiation, by C. White.

JULY 29.

The Vacuum Tube as a Transmitter, by Charles H. Plath.
My 20-Kilowatt Tube and Its Uses, by Irving Langmuir.
Importance of the Capacity Switch, by E. L. Bragdon.
The Truth about Lamp-Socket Aerials, by Harold R. Hart.
The Beginner's Catechism, by Edward Linwood.

AUGUST 5.

How to Construct and Operate the Armstrong Superregenerative Circuit, by John Kent.
Using Radio Frequency to Extend Range, by George W. May.
Things Every Radio Fan Must Know, by E. E. Hawley.
Revised Radio Dictionary, by Fred Charles Ehler.
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Human Voice Is Reproduced on a Moving-Picture Screen

SUMMER-SCHOOL students of Columbia University were shown motion pictures of the human voice in the Horace Mann Auditorium yesterday afternoon, says "The Times," New York. For three hours the students, most of them teachers from other States, witnessed demonstrations of recent advances in wireless telephony by leading engineers, including Dr. F. B. Jewett, President of the American Institute of Electrical Engineers and vice-president of the Western Electric Company, and John Mills, also of the Western Electric.

A projecting machine, the stereopticon-oscillograph, was used and the demonstration accomplished by transferring the voice waves as they were transmitted by Mr. Mills electrically over a telephone circuit to the light by means of delicately balanced mirrors. These light beams were then projected upon a motion picture screen, appearing in the forms of waves and varying in intensity, amplitude and character as the voice of the speaker varied in vowel and consonant sounds.

Mr. Mills explained that by photographing and analyzing the voice waves projected upon the screen experts were able to contrive new designs and to improve upon the transmission qualities of telephone circuits, especially in long distance cable circuits, line balances and electrical features, which must be extremely exact if the human voice is to be heard intelligently. By means of the oscillograph it is possible to determine the relative audibility of various words and expressions. The vowel "o," it was pointed out, is the easiest human sound to understand, as illustrated by the word Chicago, the final vowel of which produced on the screen a marked broadening of the light in contrast with the weaker effects of the other letters.

A feature of the demonstration was the use of college yells, "Harvard," with its broad vowel sounds, leading in magnitude of light impressions. Yale, Columbia, Chicago and other university yells were shown on the screen, where the sound impressions made by Yale was noticeably weak.

Naval Radiophone Sets for Sale

APPROXIMATELY 295 unused radio-telephone sets of short range are being offered for sale by the Navy Department by sealed bids. Bids should be mailed to United States Naval Central Sales Office, Washington, D. C.

All the sets include sending and receiving equipment known as Type CW-936, originally supplied for submarine chasers and other craft during the World War, but are believed to be good for small land broadcasting-stations as well as yachts and seagoing craft. The apparatus includes transmitter and receiver, amplifier, switchboard, dynamometer system, head set and loud speaker, but not storage batteries or vacuum tubes. The transmitting tubes, however, may be purchased for marine use according to a recent decision of the Radio Corporation of America, although they will not be sold for land commercial stations without payment of a license fee.

The bulk of the sets for sale are located at the Navy Yards at Boston, Philadelphia, Norfolk, Charleston, and Puget Sound.

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Radio, Rhythm, and Sanity

CHARLES D. ISAACSON, who, for
for some years, has been giving con-
certs in the hospital for the insane at
Central Islip, Long Island, has recently
substituted a radio program, and has
broadcast the opera "Cavalleria Rus-
ticana." It was so successful that radio
concerts promise to be a regular feature
in entertainments for the insane.

Rhythm is a state the opposite of in-
sanity. The Greeks, who had such a per-
fect ideal of balance of mind, body and
artistic form, made rhythmical exercises
the basis of their education. Many mod-
ern teachers now realize that dancing is
often a cure for neurotic patients. A due
sense of proportion is what constitutes
the highest sanity. It is also a necessary
factor in all the arts, and without it
political and social reform is sadly han-
dicapped. It is the life of humor, and
without it understanding is not under-
standing.

So here is to Mr. Isaacson's endeavors.
—"The American," New York.

Voices Broadcast Farthest

LIKE the different instruments, differ-
ent types of human voices have dif-
ferent carrying qualities on the radio-
phone. The voice carries, it is generally
believed, better than the other musical
instruments and a baritone has somewhat
better chances of registering successfully
with his invisible audience than a tenor,
soprano, or even a bass. Contraltos also
go over somewhat better than tenors and
sopranos, who have the greatest difficulty
in retaining the quality of their voices
when singing through the ether. The
latter, however, carry the greatest dis-
tance.—"The Globe," New York.

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special article, "TESTED INVENTION OF
MAJOR ARMSTRONG AMPLIFIES SET 100,000
TIMES," by John Kent, that appeared in
RADIO WORLD No. 13, dated June 24, 1922,
the publisher decided to put aside a number of
copies for those who were not able to get this
issue when published. Copies will be sent,
postpaid, on receipt of 15c. or send in your
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taining the article about Major Armstrong's
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PATENTS

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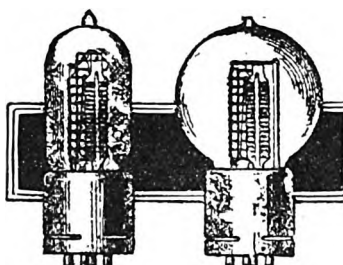
A BROADCASTING MAP of the leading broadcasting stations of the country was published on the center page of RADIO WORLD dated May 20. Mailed on receipt of 15c., or send \$3.00 for six months, or \$6.00 for a year, and start your subscription with May 20 issue. RADIO WORLD, 1493 Broadway, New York City.

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Colleges Are Helping Radio

ONE guarantee of the permanency of broadcasting appears to lie in the fact that many of the larger universities have erected their own stations at great expense, and for definite purposes aside from entertainment alone, says "The Globe," New York.

It would take a page to enumerate the various institutions that have followed the lead of the University of Wisconsin and several other western State universities who were early in the field, but apparently they have been extremely satisfied with their experiments and plan to continue their scope.

Furthermore new recruits are being added continually. At Ohio State a campaign was begun recently to raise the necessary funds for a broadcasting station from among the alumni, and at latest reports was progressing successfully. The committee reported great interest on the part of the graduates, due largely to the fact that eighty per cent. of those solicited had already acquired an interest in wireless.

Ohio State has appointed a committee from among its engineering faculty to supervise the erection of the station; they plan to use it for entertainment extensively, though its chief purpose will be educational. Being situated in the center of Ohio it is anticipated that it will serve the state in public emergencies.



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Radio Patents

RECENTLY ISSUED

Alexanderson Invention to Amplify Electric Currents

No. 1,419,797. Patented June 13, 1922.
Patentee: Ernst F. W. Alexanderson,
Schenectady, New York.

THIS latest invention, by one of the leading radiotricians of the United States, relates to the amplification of electric currents of small intensity and particularly to currents such as are used for transmitting signals. In describing his invention, Mr. Alexanderson says:

In carrying my invention into effect, I employ a plurality of electron discharge

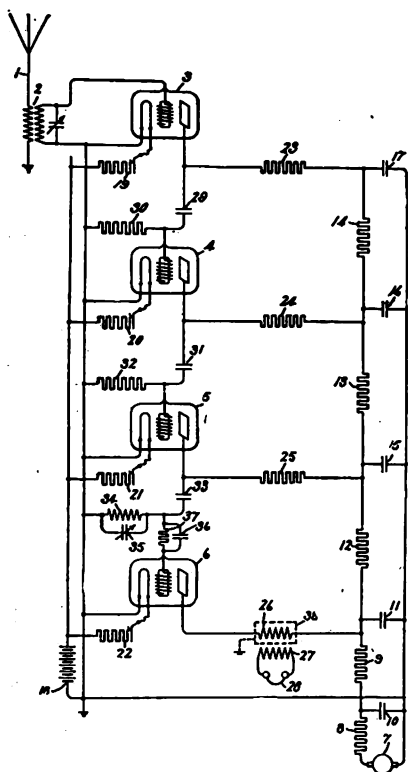
variation in the potential different between the cathode and anode of the amplifier and this variable potential is applied to the grid circuit of the second amplifier.

The variable potential between the cathode and anode of the second amplifier is in turn applied to the grid circuit of the third amplifier, and so on throughout the series. The last amplifier of the series is organized to give an intelligible indication of the signals which are transmitted by means of the current which is amplified.

One of the objects of my invention is to provide means for supplying the operating current to the plate circuits of the amplifiers in such a way that a source of current of somewhat variable potential may be employed without injuriously affecting the operation of the amplifiers. Another object of my invention is to provide a connection which will prevent the transmission from one amplifier to another of potential variations of undesired frequency, which may be set up in any of the circuits.

Radio to Relieve Monotony

AN intensive campaign to relieve the monotonous life led by light-house keepers is being launched by George R. Putnam, United States Commissioner of Light-houses. Much has already been done to improve the life and living conditions of these men, and Mr. Putnam hopes that the radio-telephone will prove the greatest boon to



relays or amplifiers, preferably of the high-vacuum or pliotron type, and connect these relays in cascade. The plate circuits of all of these amplifiers are supplied with current from a common source and a high resistance is inserted in each plate circuit. The electric current which is to be amplified is applied to the grid circuit of the first amplifier of the series and current in the plate circuit of that amplifier is varied in accordance with the well-known operation of amplifiers of the type mentioned. The result will be a

Pictures and Facts About Armstrong Amplifier

Radio World has published a number of pictures, diagrams and descriptive articles regarding the New Armstrong Super-Regenerative Amplifier. The numbers containing this material are dated June 24, July 8, July 15, and August 5. They will be sent postpaid on receipt of 15 cents each, the four copies complete for 60 cents. Or you can subscribe, \$6.00 year; \$3.00, six months; and have your subscription start with the number dated June 24. RADIO WORLD CO., 1493 Broadway, New York.

bring into close contact with the world government servants who have, in the past, often been cut off for weeks and even months at a time.

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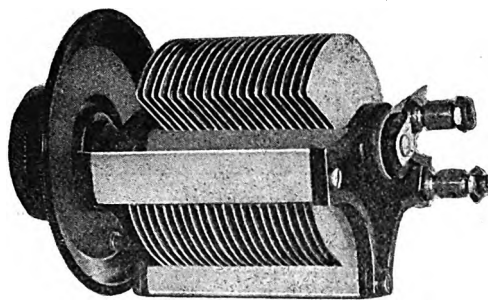
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SUPER-REGENERATION

Its Theory and Operation

CONSTRUCTION OF SUPER-REGENERATIVE RECEIVERS

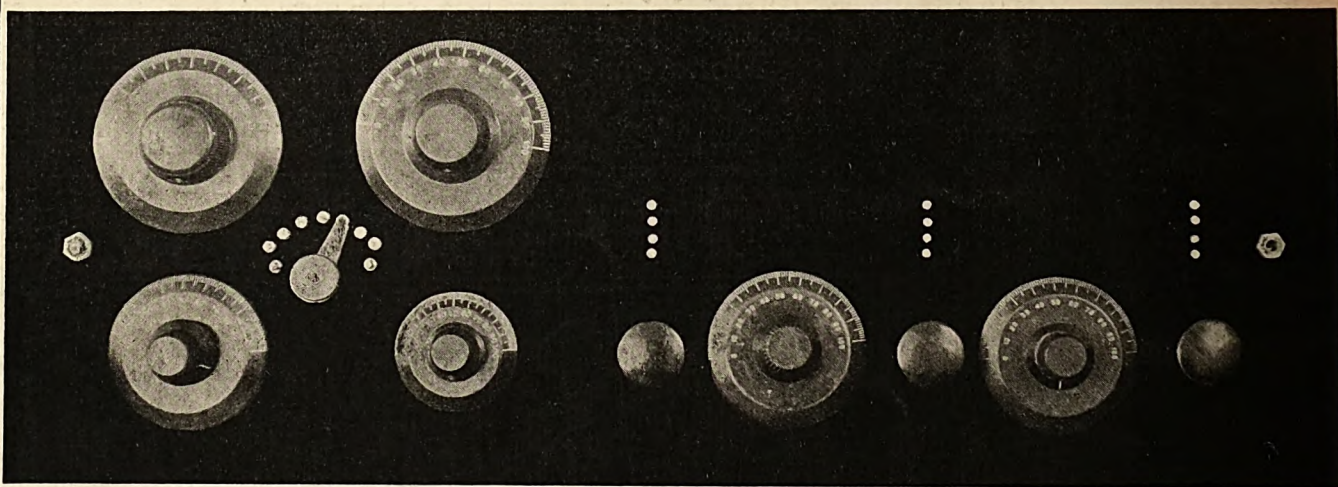
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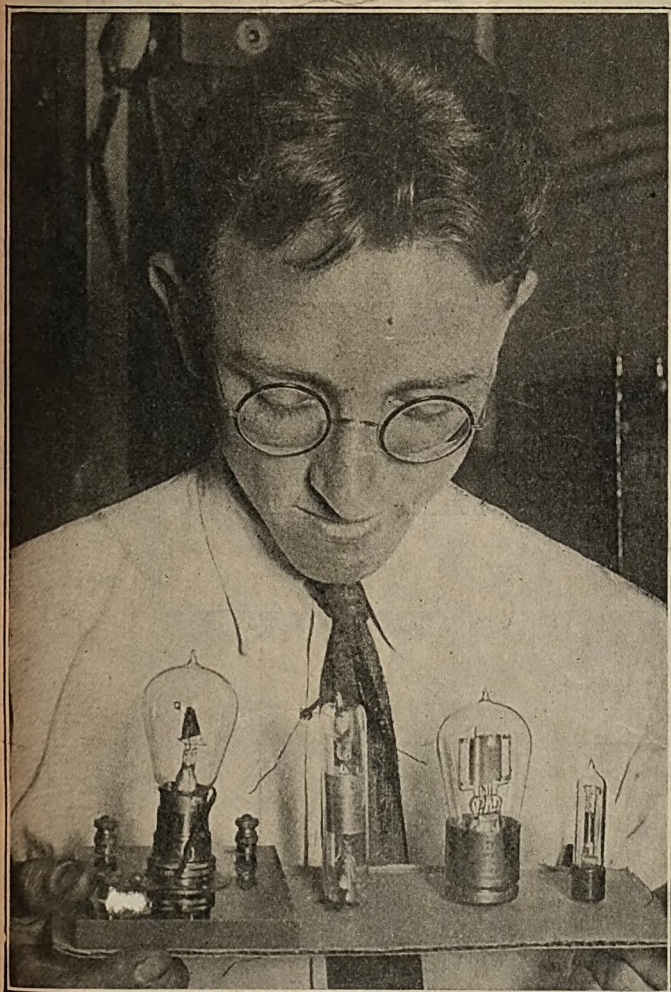
256 West 34th Street, New York City

RADIO WORLD

Entered as second-class matter, March 28, 1922, at the post office at New York, New York, under the act of March 3, 1879

I L L U S T R A T E D

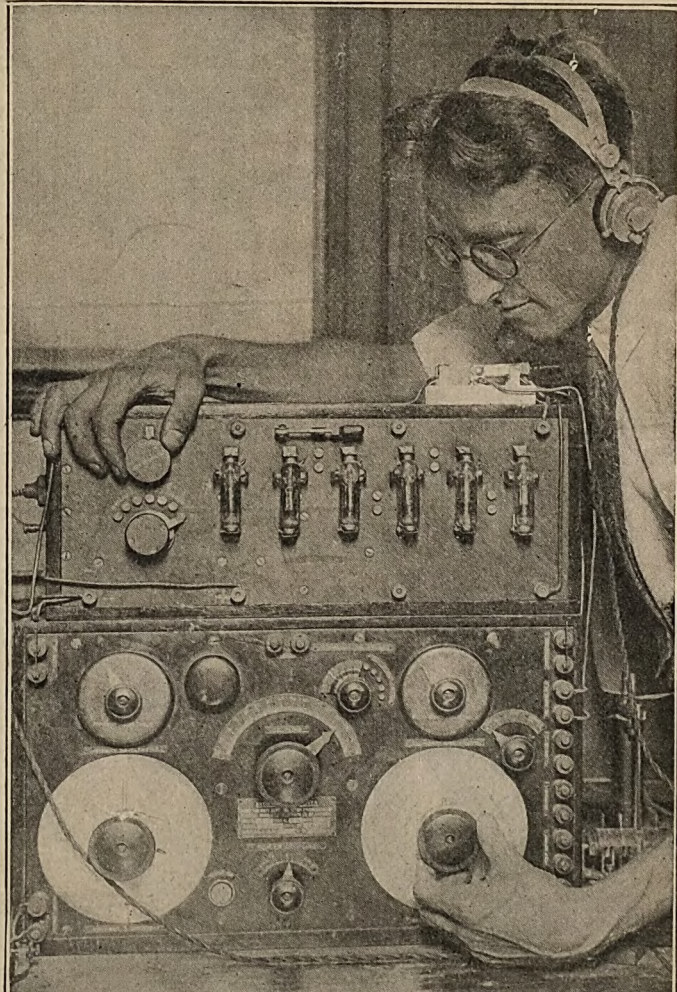
Progress of Vacuum Tube



(Both photos: C. Kadel & Herbert News Service)

Four stages in the evolution of the vacuum tube. From left: Fleming valve; De Forest tube; Radiotron; Peanut tube.

Long-distance Navy Receiver



With this arrangement ships in the Mediterranean have been heard in New York City. It is a Navy type receiver with radio frequency and is one of the most powerful in the world.

RADIO WORLD

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A Weekly Journal, Published Every Wednesday and Dated Saturday, By Radio World Company, from Publication Office, 1493 Broadway, New York, N. Y. Telephone: Bryant 4796

Vol. 1, No. 12

August 19, 1922

15c. per copy, \$6.00 a year

LATE DEVELOPMENTS ASSURE RADIO PERMANENCY

Telephone and Telegraph Officials, Seeing the Handwriting on the Wall, Now Work Hand in Hand in Radio Progress. The Armstrong Circuit, the Marconi Directional Wave, Installation of Municipal Radio Plants, and, Finally, the Linking of Paris and New York by Wireless, Are Big Elements in Stabilizing and Popularizing Radio

RADIO is not only here—it has come to stay. Any idea harbored by the uninformed that radio was a fad, or a craze, has been completely dispelled by the remarkable scientific and commercial developments of the past few weeks.

These include the much discussed Armstrong superregenerative circuit, the Marconi directional finder, the Langmuir tube, the installing by the City of New York of a new municipal broadcasting station, the erection of a new broadcasting station in the heart of New York City—on 42d Street, near Fifth Avenue—and the installing of radiotelephone systems aboard ocean liners.

All of these very important achievements are capped by the permanent linking of France and the United States by the radio engineers of the Centre Radioelectrique de Paris, at Sainte Assise, France, and the Radio Corporation of America.

This latter development is one of far-reaching economic, scientific, and international importance. It joins two great nations by more intimate bonds than ever before in their history.

Some of those who, like telephone and telegraph officials, feared that radio would hurt their business, have discovered that, instead, it will broaden the various fields, make them of greater value to the public and, in the final analysis, be an adjunct of tremendous importance, rather than something that would retard other scientific activities.

The public has shown so remarkable an interest in radio that it can be readily seen that its possibilities in a business and amusement way are absolutely limitless.

Millions of new users of radio-receiving sets are getting ready to install instruments. Manufacturers are making plans to fill this enormous demand, and wholesalers and retailers will be enabled to give the public what it wants at the right time and at the right price.

Radio has reached the point where it must be figured with the general scheme of living. It has a large place in everyday life. The coming autumn and winter will undoubtedly see an additional interest in everything that pertains to radio in

a degree more pronounced than has been evidenced in any other new science that has attracted and held public attention.

No one is going to be so foolish as to say that radio will supplant the telephone, the telegraph or anything else.

But it is very evident now that radio will be just as necessary to humanity as either. Perhaps a greater necessity.

When the telegraph was perfected there were hundreds who said it would supplant the mails—that the poor would be deprived of mail privileges because they would not be able to afford sending telegrams. Instead, postal facilities have been vastly improved and postal fees considerably reduced.

History proves that one method of communication improves another. One system help another as their characteristics enable them to perform the particular work for which they are best fitted. In other words, one system supplements another. Radio will supplement the telegraph and telephone. The three will form the great trinity of quick communication—until a fourth is developed to supplement the combination.

Radio will be the quickest method of communicating over large expanses of territory. In this number of Radio World we publish pictures of a new German station that can hurl a message to America, by radio, in one-twentieth of a second.

In the future—the immediate future—no important event can take place without radio, any more than news can be printed without a newspaper. During the coming elections, watch the part radio will play. "The World," New York, recently printed a foreign dispatch "By French Foreign Office Wireless." The crowds no longer surge about a stock ticker to get a glimpse—if possible—of some event of importance, sent dimly, letter by letter. Instead, they throng the streets surrounding a radio set—and thousands may hear easily what only a few heard before.

From the lone fisherman to the busy merchant, from the humble home in a hamlet to a millionaire's palace—in every walk of life—radio has come and is planting its roots deep—deep—deep.

And it has come to stay as an integral and important factor of all future life.—THE EDITOR.

How to Build a Portable Field Buzzer

By De Witt H. Thompson

WHEN a radio beginner has mastered code sufficiently to copy a part of what some of the slower stations are sending he will, no doubt, begin looking forward to the time when he can transmit and receive with sufficient speed to enable him to procure a license to operate a radio transmitter of his own.

For code practice, he may have tried practicing with a fellow amateur, using a single-buzzer practice set with both the sender and the receiver in the same room. Considerable progress may be made this way in learning the code. However, a better method—as soon as the student is far enough advanced—is to use two-buzzer telegraph sets and a line separating the sets far enough apart so that it is unnecessary to yell back and forth every time one or the other makes a mistake.

In this way one has to depend on carrying on all communication by the signals, and more rapid progress will be made. Calls should be as-

After having tried out various types of buzzer sets, the writer feels that he can recommend the one reproduced in the accompanying illustration (Figure 1), wherein a wiring diagram is shown. It is of simple construction and high efficiency. The set constructed by the writer is arranged in a small box or case. The buzzer, flash-light battery, key, and binding posts for the receivers are inside the case. The line and the ground connections are mounted on the outside. There is also room in the case to carry paper and pencils for copying. For convenience, the battery should be arranged to fit into the case between spring contacts so that when a new battery is required it is necessary only to remove the old one and snap in a new one.

The type of key, the type of buzzer, and the general construction of the set has been left to the builder so that he may use, so far as possible, whatever materials he may happen to have on hand. For receivers, I use a regular radio double-headset.

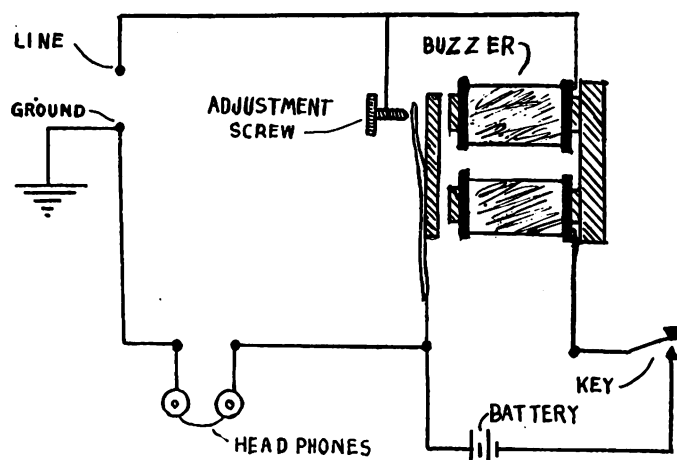


Figure 1. Sketch to show the wiring for the type of buzzer described in this article. Drawn by De Witt H. Thompson.

signed to each set and the regulation method of "calling" and "signing off" should be adhered to at all times. Then, too, the "Q" and other conventional signals should be used whenever possible, and all transmissions carried on in accordance with recognized methods of handling traffic, such as the traffic regulations of the American Radio Relay League. In this way the practice obtained in connection with these sets helps to better fit one for the time when he will be operating a radio transmitter of his own.

For the ground connection any small iron rod about $2\frac{1}{2}$ feet in length, with a sharp point on one end and the ground lead attached to the other end, may be used.

For the line wire, almost any small magnet wire, such as that taken from the secondary winding of a discarded spark-coil, will serve satisfactorily; or, one wire of a wire fence might be used for moderate distances where convenient.

On one occasion, the writer and a friend used two of these sets successfully over nearly a half mile of

When Out of Tune

THE use of undamped oscillations will materially assist in the sharp tuning necessary to prevent interference by the use of standard wave lengths; but neither undamped nor damped oscillations can be relied on to completely eliminate the effects of the vagrant waves and local electrification called "static."

Every lightning discharge produces powerful electric waves which affect conductors at great distances. As thunderstorms—in warm climates and especially, in summer—are almost continuous in the sense of existing somewhere in the area in which they affect detectors, the interference caused by them is almost continuous. The waves created by lightning discharges vary greatly in length, but are highly damped and affect all aerials.

At every radio station, the air at the top and foot of the aerials is at different potentials. The atmospheric potential-gradient at any station varies with the time of the day, the season of the year, and the local weather conditions. It is usually deeper in summer. This difference of potential tends to equalize itself through the aerial. Inductively coupled receivers afford a direct path to ground, so that static charges do not accumulate on the aerial, and the inductive coupling weakens the energy transfer of all induced currents out of tune.

very fine silk insulated wire which was allowed to lie on the ground nearly the entire distance. One ground-rod was placed in a small creek and the other at the base of a small tree. This was during an extremely dry period when there was very little moisture near the surface of the ground. Yet, successful transmission was carried on with the ground rod at the base of the tree forced into the ground only two or three inches. However, the signal strength was somewhat increased by driving this rod deeper into the earth.

On another occasion, we followed the banks of a river, using nearly three-quarters of a mile of about No. 30 enameled copper-wire for the line supported on trees and bushes and the usual earth return. At this distance the signals were practically as loud as when we were only a few rods apart; hence, these sets will undoubtedly work over a much greater distance than we have yet attempted to cover.

In conclusion, the advantage of such a field buzzer-telegraph set constitutes an excellent means for code practice,

Using Two Tubes for Receiving

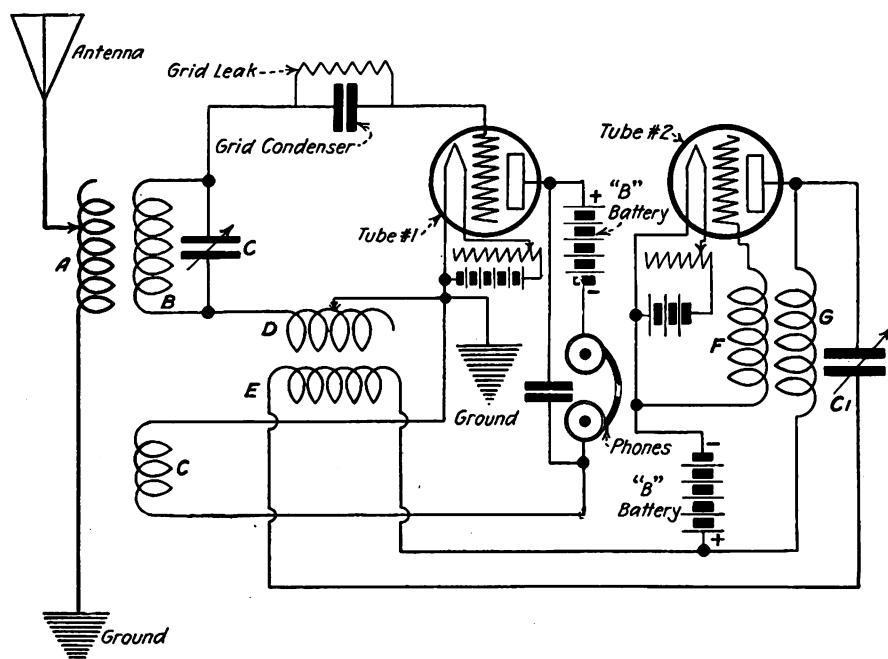
By C. White, Associate A.I.E.E.

WHILE the employment of two tubes in a radio-receiving set is nothing new to the advanced radiotrician, it does present a very decidedly new phase of the subject for the novice. Generally we are so much accustomed to look upon radio receivers as consisting of a single-tube detector with or without several stages of radio or audio-frequency amplification, that the idea of employing more than one tube to detect a signal is unusually interesting.

In the modern regenerative-receiver, the vacuum tube is really made to perform a double function; first, to generate local oscillations, and, second, to detect the incoming wave. Some may rigorously object to the last statement; but it is obviously true that such a condition exists, since we can separate these two functions and still have a receiver. That is to say, any oscillatory generator of high frequencies and any style of detector, crystal or bulb, will perform these two operations independently and yet produce the desired result. But, on the other hand, we all agree with the fact that if one tube is made to perform the double function of generator and detector, flexibility of operation and control must be sacrificed. In this, I do not mean to criticize the regenerative receiver from the standpoint of economy, in which field it is undoubtedly paramount; but I do wish to bring forward the fact that we can not hope to get as much ease of control and efficiency from one tube as from two. One fault, due to the employment of a single tube, lies in the fact that we can not control to the best advantage the amplitude of locally generated oscillations and, at the same time, detect to the best advantage.

To get down to brass tacks, let us study the case of one particular type of heterodyne receiver making use of two vacuum tubes. Such a circuit is illustrated in Figure 1. It is the identical circuit used by Major E. H. Armstrong, for experimental tests, at Columbia University in 1917, and was definitely verified as one of the very best hook-ups for long-distance reception. This receiver is actually superior to any other for its class of work.

In Figure 1 tube No. 2 acts as the generator of the local oscillations and the frequency of the same are practically determined by the value of the inductances E and G , and the intensity of the mutual coupling between F and G , together with the value of the capacity C' . It is recommended that the coupling between F and G be kept at a point greater than is ordinarily



Schematic diagram showing the two-tube circuit. This circuit was used by Major Edwin H. Armstrong in experimental tests at Columbia University, and was definitely verified as one of the very best hook-ups for long-distance reception. Suggested by C. White. Drawn by S. Newman & Co.

considered a maximum, so that the local oscillations will not be disturbed when conditions elsewhere in the circuit are changed. The actual amplitude of the local oscillation impressed upon the grid of the detector tube No. 1 can be effectively controlled by varying the coupling between D and E .

A , B , and C are tuned to the frequency of the incoming wave; but the coupling between B and C must be maintained at a very low value in order that the detector tube No. 1 be kept from oscillating. Let it be noted that by properly adjusting the coupling of B and C , the effective impedance of the tuning circuit may be reduced to almost zero. There-

Filament Regulation

AS a general rule most amateurs and experimenters are tempted to let the filaments of vacuum tubes burn too brightly. Signals are at their best when the brilliancy of the tube is at its lowest. Increasing the filament current beyond this point does not increase the signal strength, but increases the strength of static interference and tends to lessen the life of the tube considerably. It would be well to follow the idea of keeping the filament as low as possible, consistent with good reception. With certain types of tubes the efficiency of the tube is at its best when it is at its lowest temperature.

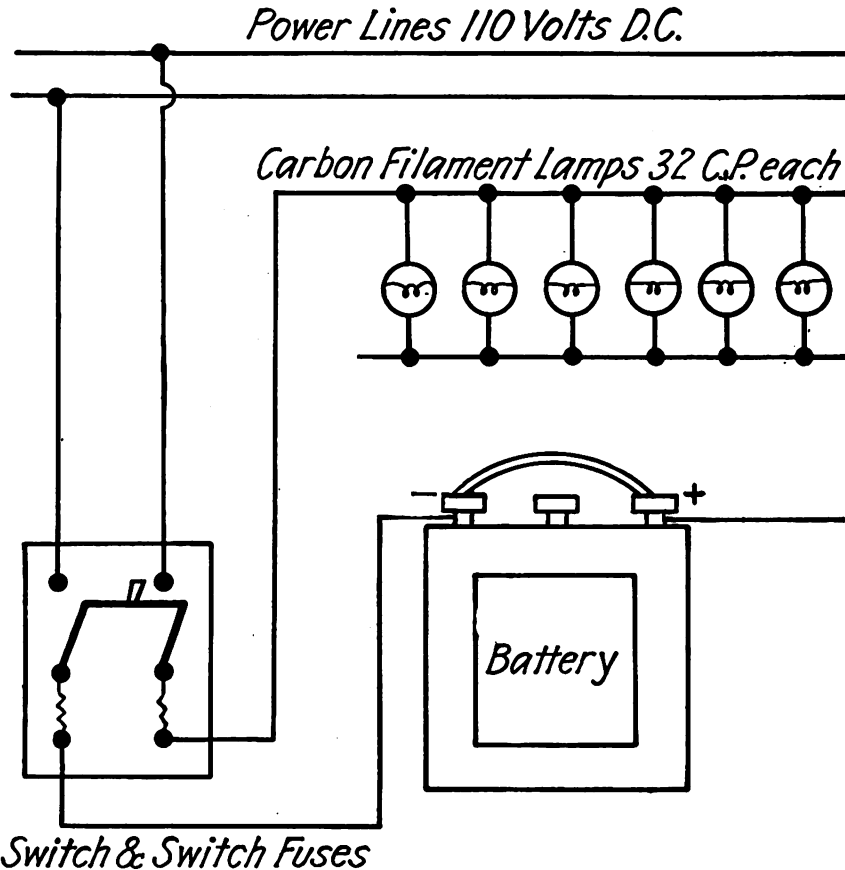
fore, the current caused to flow in the grid circuit from a weak signal is many hundred times the current that would flow in the ordinary type of receiver. When A and B have a low resistance and the grid circuit of the detector is well adjusted, the selectivity is extremely sharp and very little power is dissipated in operation.

For those of my readers who wish to construct a receiver built on this principle, I shall endeavor to give a few hints as to the actual size and arrangement of the various parts. The unit A , B , and C , is a vario-coupler with two rotors instead of the customary one; coil A is the stator, and B and C are the rotors. The condenser C must have a capacity of .001 mfd., while D and E is nothing more than an ordinary vario-coupler. C' is a 43-plate condenser and F and G is a vario-coupler. Of course AB and FG should be of a size to give the desired wave-length reception. Tube No. 1 is a soft detector tube (UV 200), while No. 2 is a hard tube (UV 201 or UV 202).

The following facts should be borne in mind: *First*—this receiver is superior only for long-distance work. For short-distance reception, the regenerative and superregenerative circuit is more economical and efficient. *Second*—great care must be taken in the actual construction and operation since the adjustments are many and manifold. This type of receiver is given the name of the superheterodyne.

The Storage Battery as an Important Factor in Radio Reception

By Donald Van Wyck, R. E.

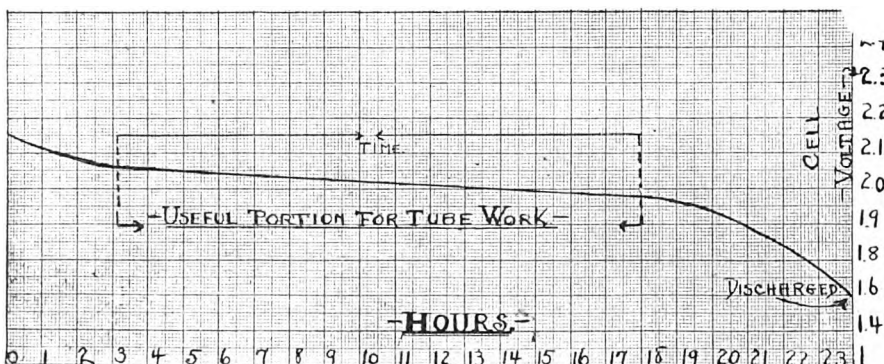


Schematic circuit showing the charging of a storage battery. Each lamp permits an ampere to pass. Lamps may be carried to suit charging of battery. Suggested by Donald Van Wyck. Drawn by S. Newman & Co.

STORAGE batteries for radio work were classified by Dr. Lee de Forest, in the early days of radio, as the A and B battery. The A battery supplying the filament current for the tube, being of a low voltage, high-amperage type, while the B battery, the opposite, being of a high-voltage, low-amperage battery. The B battery is practical—it is of the storage type—but the cost of such batteries is

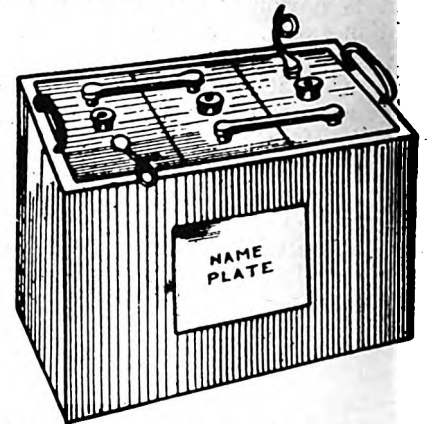
the deciding factor. We are, however, only going in detail here in regard to the A battery.

It has been common practice among amateurs to use almost any type of storage battery, regardless of its capacity and design. Storage batteries, like every other electrical device, in order to function satisfactorily, must be designed with a given purpose in view.



This chart shows a measured scale with the radio operator where the proper voltages may be secured when using a storage battery. The most useful part of the battery for tube work is indicated by the space between the dotted lines.

There are storage batteries especially designed for radio apparatus that have characteristics which differ from the storage battery manufactured for automobiles, telephones, and for other special work. An automobile battery is made up with thin plates and separators in order to enable the battery to give a very high rate of discharge for a short period. This, of course, is necessary when the battery is used for starting purposes; but it must be remembered that while the automobile is running the battery is being charged constantly. One of the first questions the radio amateur must decide is the



Three cells are shown in the make-up of this storage battery. The two end poles are negative and positive poles respectively.

size; and, in this connection, cost is generally the deciding factor. Still there are other considerations that should make cost a secondary matter—rating, weight, life, and internal design.

The radio-storage A battery should never exceed six volts as the vacuum tubes will burn out immediately. If not, they will be very short lived. This means that if six volts should be added, to more voltage of another battery, or a more powerful battery supply the six-volt battery. Storage batteries are also rated in ampere hours. Ampere hours mean what the battery will deliver in a given time. Thus a forty-hour ampere battery will deliver one ampere for forty hours. Naturally the higher the ampere-hour rating the longer the battery will go without charging. A high ampere-hour battery is extremely heavy, due to the lead plates, solution; and the transporting of such a cell to and from some outside charging-station is very troublesome. A large cell gives a steady discharge. In the operation of vacuum tubes it becomes a very important consideration.

Do not get a battery of less than

Secretary Hoover's Committee to Pep Up Congress in its Radio Law-Making



(C. Harris & Ewing. From Paul Thompson, N. Y.)

Members of the newly appointed Interdepartmental Advisory Committee on Governmental Radio Broadcasting, photographed in front of the Department of Commerce, after the first meeting. This committee is composed of representatives from ten government departments, together with representatives from the office of the Director of the Budget and the Shipping Board. The chief work of this committee is to urge Congress to get busy and consider the several bills now before that body to regulate and standardize broadcasting and to take some action regarding other important radio matters. It is possible that the scope of the committee's activities may be extended beyond the subject of broadcasting, and that the committee will act in an advisory capacity to the Secretary of Commerce in matters of government radio regulation, and, further, will consider all radio questions of interdepartmental interest. Those in the group (left to right) are: James C. Edgerton, Post Office Department; F. P. Guthrie, Shipping Board; Captain H. P. Perrill, Chief Co-ordinator's Office; Dr. S. W. Stratton, Bureau of Standards; J. C. Gilbert and W. A. Wheeler, Department of Agriculture; A. E. Cook, Labor; L. J. Heath, Treasury.

(Continued from preceding page)
sixty ampere-hours, as such a battery will have to be recharged too often. Dry cells are not at all suited for this work and should not be used, except in cases of emergency. When a number of these tubes are used, a set of dry cells will only last a few hours only to be thrown away or replaced by a new set. An expensive proposition.

As the voltage of a battery changes while in use, frequent adjustments are avoided with the larger type of cells. As a matter of fact, we should only use about 60 per cent. of the theoretical discharge time to avoid changes in the filament current.

Two things are essential to keep battery up to standard:

In the first place, the owner should provide for a home-charging device so the battery can be placed on charge as it gets low. A good rectifier is also handy where D. C. is not available. If D. C. is to be had, then all that is

needed is a bank of lamps, as shown in the accompanying diagram. The rectifiers may be purchased for a reasonable sum, and the amateur who owns a set is, indeed, lucky. With the charger, it simply means that a large capacity-battery may be installed because it need not be moved. About every third or fourth night, the battery may be left on charge all night. Thus it will be seen that there will be no shutdown of the radio set owing to the discharged condition of the battery. This is, by far, the best way to use a battery as it will be kept charged up and in good shape for work.

Secondly, always to keep the battery fully charged, as an idle battery-discharged cell deteriorates within a few weeks. An open circuit test is not a good indication of the state of a charge of a battery. To keep the battery in good shape and working condition, the owner should have a reliable hydrometer. A good one may be purchased

for \$1.50. The best types have devices on the sides to prevent sticking to the sides of the tube because of capillary attraction. If the float sticks, the readings are useless. If the battery is fully charged, the hydrometer should read between 1,280 and 1,300 degrees on the scale. If discharged, it will read about 1,125. The battery should never be allowed to get so low. If it does, it should be immediately placed on charge. Sometimes, while charging, a battery is left too long on charge. Then suddenly the hydrometer shows over 1,300, or what we term an overcharge. This condition is about as bad as an undercharge. Readings should be taken frequently to see that the battery is in good shape. We should remember that a storage battery is a delicate affair, even if it does weigh much, and care must be taken that it does not deteriorate quickly. By keeping distilled water on the plates of a battery, no trouble should arise.

New Radio Record Is Chalked Up by United States Shipping Board: *NOT ONE SHIP LOST IN THREE YEARS!*

By Carl Hawes Butman

DUE almost entirely to the use of radio on the Shipping Board's fleet, not a single ship has been lost without trace during the past three years, according to F. P. Guthrie, chief of the radio section. Whatever hard knocks the board may receive, little can be said against its radio equipment and its operation. Practically all Shipping Board vessels are now equipped with audion-tube detectors, which also have been made available for general marine use through the insistence of the board, making for greater safety in sea travel. Ships, human lives, and money have been saved. In general, radio has a fine record in all government services.

Mysterious disappearances at sea are seldom heard of to-day—ships which disappear, or return crewless, as did the "Marie Celeste." Due chiefly to radio, the safeguard enabling ships to converse together freely and communicate with one port or another every day, there are few such disasters. The Naval collier "Cyclops" is practically the only "missing" vessel recorded since the advent of the radio law at sea in 1912, except during the World War.

The Coast Guard, the Navy, and Bureau of Navigation of the Department of Commerce all indorse radio highly, yet no bureau keeps a record of what radio actually does toward life and property saving at sea. Lost ships are recorded to the number of 380, from all causes, for the year 1921; but the number saved, thanks to the SOS, is undetermined. A year ago, the Shipping Board reported that, approximately, 500 vessels in distress or temporarily disabled were reported by radio, and that about 190 were towed to port through arrangements made by radio. This assistance rendered by the radio of Shipping Board vessels, augmented by other radio warnings in all parts of the world, protected many thousands of lives and billions of dollars worth of property, but no adequate estimate can be reached.

The aid radio brings is interesting: Within the past three weeks, the steamer "Wassaic," whose call is KROO, experienced boiler trouble about 350 miles southeast of New York. Her SOS was answered by KEFT, the "City of Eureka," another Shipping Board vessel, which towed her into New York safely. When

WDOO, the "Federal," stripped her turbines and sent out a distress call 200 miles northeast of the Bahamas, the "City of Weatherford" soon steamed alongside and arranged to tow the disabled vessel to Mobile. Another Shipping Board vessel was towed from off St. Nazaire, France, over 2,000 miles, to an American port in response to a radio message to sister ships bound west, thus saving tremendous salvage payment. Without radio she might have awaited assistance for months.

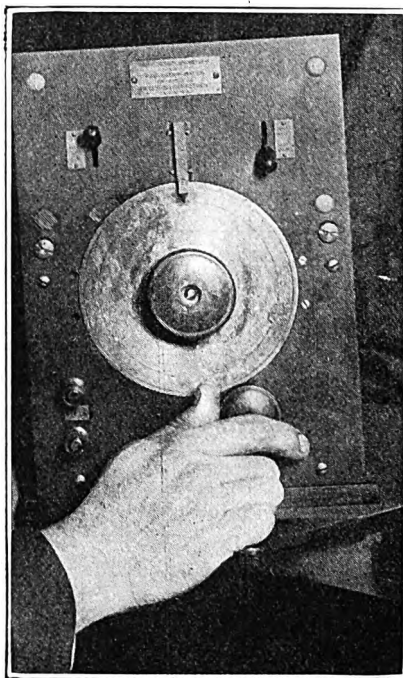
Lack of radio facilities shows its value best. When the radio of the "Western Hero" got out of order on a cruise, she was literally "lost" for two weeks, but "found" when it was repaired. A cargo ship whose radio officer died, sailed without waiting his replacement, and, in endeavoring to pursue the northern transatlantic route without radio, ran into icebergs and damaged herself to the extent of about \$10,000. She could not pick up the Naval Hydrographic Office warnings nor the messages of the Revenue Cutter on ice patrol.

Today, the activities of the Shipping Board are less than a year or two ago, there being only about 400 vessels in commission. Radio maintenance on the many laid-up ships has been reduced materially and a saving of, approximately, \$130,000 achieved by the assumption of the upkeep by the Board and the elimination of repair shops maintained by outside radio contractors in seven ports. For radio messages transmitted, the board collected \$30,000 during the past year.

Business of the board is expedited greatly by the operation of a special radio station established at London, which, in co-operation with the Naval Communications Service, handles all transatlantic radio messages for London officials direct from Annapolis. Frequently, Mr. Guthrie states, messages filed in Washington at the close of business on one day are answered by the time the Washington office opens on the next. The London radio-supervisor estimates that a saving of over \$11,000 a year is effected by using radio for transatlantic dispatches. Radio messages to Panama, Manila and the Orient are also handled through Naval co-operation, saving almost \$5,000 a year over cable charges.

In technical development, the Shipping Board has experimented with a two-kilowatt arc set installed on the "President Adams," which succeeded in communicating with American stations while the vessel was in the English Channel. The operation of this set is said to be almost entirely automatic, being a new departure in the construction of sets. The "Eastern Admiral" and "President Polk" were also equipped with two-kilowatt arc sets with good results after a direct comparison with spark sets.

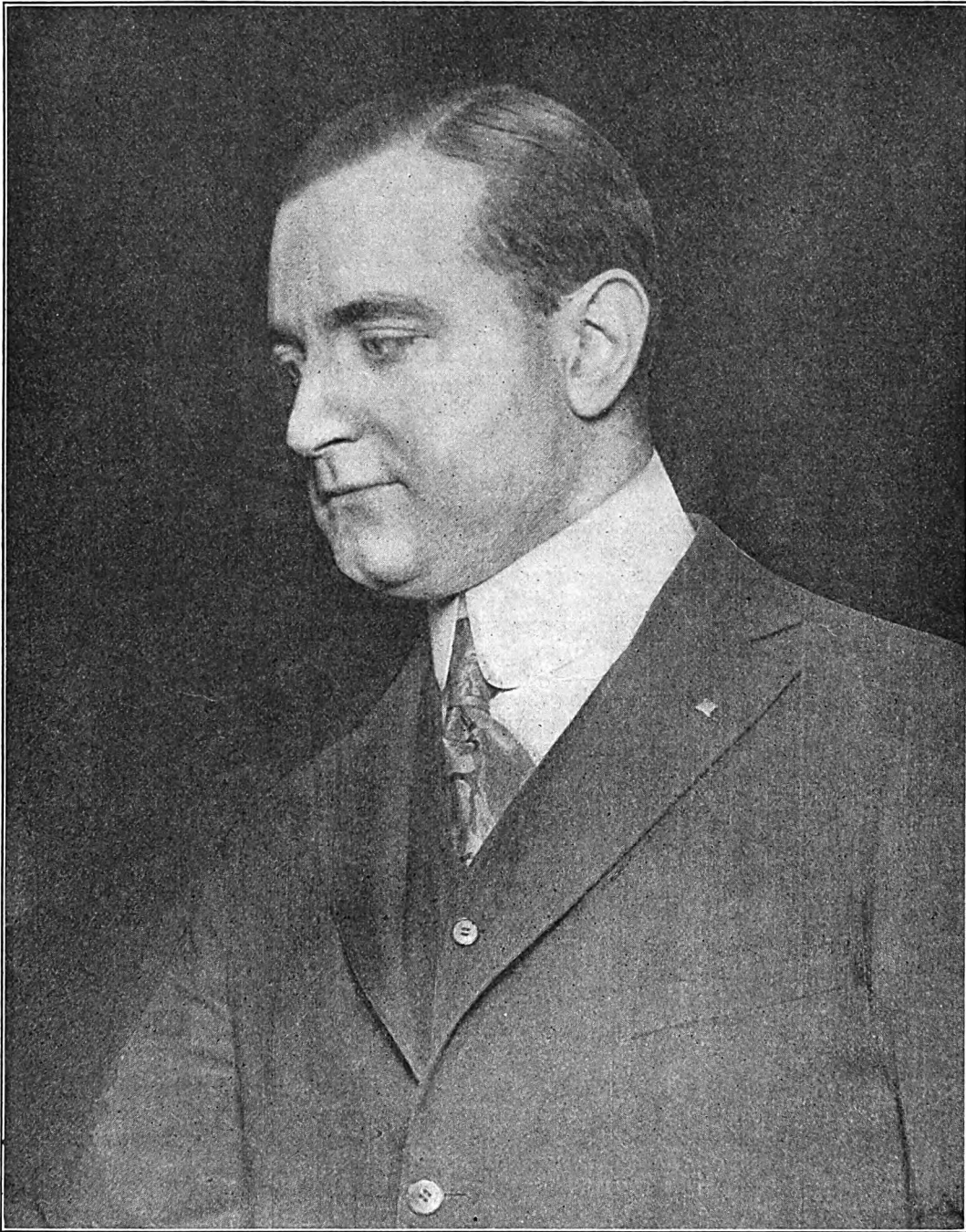
New Uni-Control Receiver



(C. Kadel & Herbert News Photos)

This photograph will interest amateurs who would like to see radio develop to the point where it will only be necessary to "push the button" to hear concerts. It is the new "uni-control" receiver developed some time ago by Dr. Alfred N. Goldsmith of the College of the City of New York. With this receiver one control is used to change wave lengths of antennae and secondary circuits, also altering the tickler coupling at the same time. The wave length of this receiver is from 200 to 3,500 meters. An additional switch is provided to slightly alter the circuits so as to receive continuous waves. A complete detector and two-stage amplifier using "peanut tubes" is included. The small knob is for finer adjustment.

Radio World's Hall of Fame



(C. Kadel & Herbert News Service.)

ALFRED N. GOLDSMITH, Ph. D.

Professor in Charge of Electrical Engineering of the College of the City of New York

Dr. Goldsmith is, also, Director of Research of the Radio Corporation of America, the dominating organization of the radio industry. In this important work he is in closer touch with progress and development of radio communication than any other man in American radio. For many years he has directed the radio laboratories of the College of the City of New York. His interest in radio was born here when but a few advanced scientists had recognized the possibilities of the Hertzian experiments as a means of communication. He set up the first arc radio in the United States. He has heard signals from Germany. Dr. Goldsmith has seen radio grow from modest beginnings to a day when its spread resembles the spirit of success. But, unlike some of his contemporaries, it has not distorted his vision of the future.

United States Submarines to Be Made Effective with Radiotelegraphy

WASHINGTON, D. C.—Radio engineers of the U. S. Navy Department have been so successful in the development of a special radiotelegraphic transmitting and receiving set for submarines, that 59 new sets have been ordered. They will be improvements on the experimental set installed on the S-50 which paid a visit to Washington recently, and was said then to be one of the best equipped submarines in the world. The sets will be constructed on confidential specifications drawn up by the Radio Section of the Bureau of Engineering, based on experimental sets building at the Washington Navy Yard.

Approximately \$300,000 has been saved on paper—not an actual saving because the Navy did not have the money to save. What the radio experts accomplished, however, is a remarkable saving, because practically new and very excellent long-distance sets will be available for all the big "subs" at a very small cost. By re-designing and remodelling old apparatus, barring a few small innovations and parts, the Naval radio experts have built up an entirely new standard submarine radio set, better than that on the S-50.

The results in radius of action, Rear-Admiral Robison, chief of the Bureau of Engineering, says, are twice what the radiomen hoped for when they began the experiments some months ago. In other words, instead of a radius of about 100 miles, the "subs" will have a radius of radio transmission better than two or three times that distance in ordinary day-time communication.

The first set was installed on the R-22, and the resulting experiments proved that an excellent practical submarine set had been evolved by remodelling surplus apparatus and scraps of present equipment. New apparatus manufactured by commercial concerns along the lines of the perfected specifications would have cost the Navy in the neighborhood of \$5,500 per set, instead of \$500, the estimated cost of remodelling and assembly. Fifty-nine times the difference is \$295,000 saved.

Another remarkable feat accomplished by the Navy was the perfection of the details of the set within six months. The original submarine set developed and built by a commercial concern required two and a half years, it is said, or five times as long. When all the subs are equipped, Naval experts believe that these craft of the American Navy will be just a bit better

By J. D. Smith

equipped than those of any other navy in the world.

Very few details of the new sets are revealed, but it is known that they are vacuum-tube sets developed along original American lines. Late during the World War, German submarines floating on the surface succeeded in sending messages during the night as far as 800 or 1000 miles to their bases by using short wave-lengths of about 300 meters. Spark sets were used until the last few months of the war, when vacuum tubes were introduced in sending, although they had been used in receiving for about a year. The German spark was operated on a 500-cycle frequency about two kilowatts capacity. Much of their equipment was held very confidential, and after an unsuccessful engagement they threw the important parts overboard or into the bilges. Although arc-transmitting sets are said to be dangerous for submarine use on account of the gases given off by the many electrical storage batteries, two-kilowatt arc sets were used in British "subs"

successfully. In American submarine practice, a grounded loop is used. This aerial is very efficient and consists of a highly insulated wire grounded at the extremities of the hull and running to a mast amidships. Two down leads of the loop pass through watertight insulators into the hull, where the primary of the circuit is connected in series. The loop is connected with the standard Naval radio equipment by the ordinary means, except that a condenser in series is used when transmitting.

Owing to the ability of the under-sea craft to submerge with the aerial in place, it is possible to receive long-wave signals under water to a depth of about 20 feet, and short-wave signals to a lesser depth. In 1919, a submarine—16 feet under water off New York—picked up signals sent out from Arlington, 200 miles away, and while submerged at eight feet, heard Nauen, Germany, 4,000 miles distant, and, also, San Diego, California.

On underwater transmission little is available for publication, but it is understood that transmission as well as reception is practical.

How Radio Will Help the Air-Mail Service

By Washington R. Service

WHILE the radio work of the Department of Commerce, Public Health Service, and bureau educational services may be more instructive, the plans of the Post Office for aiding its transcontinental-mail pilots by radio, especially in night flying, is by far the most interesting. Fourteen flying fields stretching from Hazel Hurst, Long Island, across the country to San Francisco are already equipped with radiotelegraph and telephone service for broadcasting, and all mail planes will soon be fitted out with radiophone sets capable of transmitting 125 miles. This maximum communication distance is sought in order that a plane may be in contact constantly with at least one field, the fields being, approximately, 250 miles apart.

The safety of the pilots is as essential as the transit of the mail; therefore, when a plane is damaged or delayed, radio advises of the predicament, hastening what aid is needed and the disposition of the mail. In

some instances, the mail is carried only part way across continent, by plane, the railroads acting as relays between flights. By this method at least two days' time has been saved between New York and San Francisco. An experimental letter reached Salt Lake in two days.

Night flying will speed up the mails materially and night flying is planned with the aid of radio. In working out the problem of a light and compact phone transmitting set, Superintendent J. C. Edgerton and Assistant Superintendent Charles I. Stanton, have been testing out a mail plane in Washington, equipped with a Naval SE 1370 transmitting set and a special six-stage amplifier. The DH4 B-plane, so equipped, flew over Washington, maintaining constant communication with the air mail and radio headquarters in the Post Office Tower and Bolling Field. From distances up to about 15 miles the set worked well, and messages were transmitted over a distance of twenty miles, although the words

A Birthday Radiogram that Brought Good Cheer

HELLO! officers and men of the Coast Guard: This is Edward Clifford, speaking, Assistant Secretary of the Treasury, having supervision of the United States Coast Guard, a bureau of the Treasury," said the Assistant Secretary over the Naval Radiophone circuit at Anacostia on the evening of August 4.

"I am sure this is the first time an Assistant Secretary has spoken directly to you through the air," he continued. "The development of the radio has had a tremendous influence upon the work of the Coast Guard, greatly increasing its efficiency and its value to the country. The perfection of the radiophone will doubtless open up even a greater field of usefulness, and in a few years it may be a common practice for the Treasury to talk with an individual ship at sea, or, indeed, the whole service. I am calling you up to congratulate you on this the one hundred and thirty-second birthday of the Coast Guard. I hope that, wherever you may be, you are observing this anniversary of the service. It is a fine thing to belong to an organization that has behind it a record of one hundred and thirty-two years of splendid achievement in peace and in war, and that has ahead of it a great opportunity for constructive work. The history of the Coast Guard goes back to the foundation of our country. On August 4, 1790, George Washington, President of the United States, approved an Act providing for the construction of 10 revenue cutters. * * * The magnitude of the work of the Coast Guard in time of peace may be illustrated by the fact that during the fiscal year ended June 30, 1921, the service saved or rescued from peril 1,621 lives, and the value of the vessels assisted by the Coast Guard, including their cargoes, was over sixty-six million dollars." cargoes, was valued at over sixty-six million dollars."

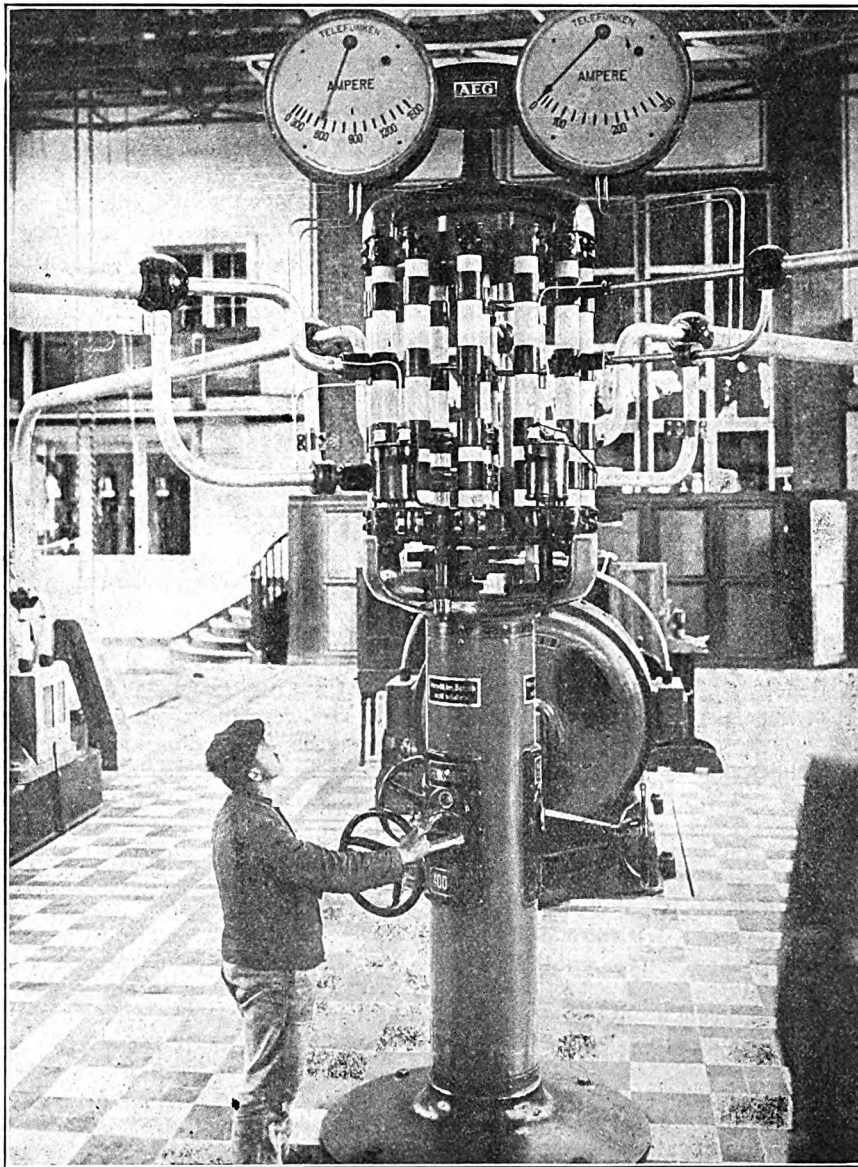
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were barely audible. Improvements are being made which, it is expected, will improve the set and secure an approximate 125 mile radius and cut the weight 100 pounds. The set is capable of tuning to four waves: 507, 600, 800, 975 meters; but to date only 507—the Naval airphone-wave—has been used. The tests are conducted each day from 4 to 5 p. m., in an effort to eliminate "bugs," but new and improved apparatus is being designed on a lighter and simpler basis. When maximum distance and audibility are secured, a number of sets will be built for the long-distance mail planes in use.

When the phones are installed it is expected that a night pilot can get his position from two radio stations, just as a ship at sea gets bearings from radio-compass stations. Radio would also advise the pilot of weather and ground conditions while he was enroute between stations, eliminating the possibility of accidents in landing in fog or on washed-out fields. The radiophone is used so that the pilot need not learn the code and so he can talk directly into a transmitter and not take his hands from the "wheel" to "send." He talks as he drives, so to speak, and hears as well.

From Germany to America in One-twentieth of a Second

(Both Photographs C. International News Reel.)



From Nauen, Germany, to Riverhead, Long Island, in the marvelous time of one-twentieth of a second! This is the flash of time in which a message may be sent by radio across the Atlantic Ocean from the powerful new German station shown in the above photographs. The upper photograph is the exterior of the station with the gigantic directional aerials facing the American continent. The lower photograph shows that part of the apparatus which regulates the flow of current to the transmitter.

Why Radio Is of Vital Importance to Everybody

By Edward J. Nally
President, Radio Corporation of America

"Future of Radio Is Assured"—President Nally

CONTRARY to the popular understanding Radio has not come to us suddenly. It has been under development continuously during the past twenty-two years. Commercial radio communication, that is, overseas radio telegraphy, has reached a high state of development and has found its place in the commercial world.

Radiotelephony has been under development during the past fifteen years, and during the World War was successfully used for both one-way and two-way communication.

Popular radio—relatively short-distance radiotelephone broadcasting—is the outcome of the realization of the vast possibilities of one-way transmission of

news matter, vocal and instrumental music, lectures, sermons, etc.

Radiophone transmission from central, organized sources of information and entertainment makes it possible for the citizen to receive this service through the small instrument involved in purchasing a radiophone receiver.

It is not communication in a two-way sense. Radio broadcasting is the employment of a fairly well developed science to a new use. Broadcasting is the recent development—not Radio.

The future of radiotelegraphy, therefore, is assured. It already has a healthy and well-defined field. The future of radiophone broadcasting is another matter, and in this we can speculate with only the imagination limiting.

THIS brief outline of some of the aspects of radio is written from a viewpoint not often presented to the public at large. My purpose is to show it as an auxiliary to commerce rather than to stress the more familiar keynote of the "wonders of wireless," which have been the subject of many articles in the daily press. True it is very baffling, from a scientific "reason why" standpoint; but so is electricity, which no one has yet been able to define.

The fact that radio communication is the one medium capable of placing isolated communities in instant touch with the centers of civilization has a boundless appeal to the imagination. That, too, it has forever ended the vast silences of the sea further adds to its romance. However, until it becomes a general household utility, it will probably remain in the public mind as something very mysterious; a sort of witchcraft, interesting, but making little appeal for intimate acquaintance; and comparatively few people realize that this means of communication has already a fixed place in the world's affairs; that it is, in fact, an economic factor of major importance, and world wide in its applicability.

The underlying reason for the rapid strides it has made is not because of its romantic, intangible or mysterious nature. Its important position in the field of communication is due solely to its utility, in combination with the three essentials of accuracy, speed and economy.

In addition to providing mariners with weather reports, storm signals, and warnings of possible dangers to

navigation, it enables passengers at sea to keep in touch with world affairs and with the movements of commerce and industry. Daily news-bulletins are published on practically all of the ocean-going vessels, and transactions of great magnitude and of momentous importance are being carried on constantly between ship and shore through the medium of radio communication.

In its international application, radio is, to-day, carrying overseas a very material percentage of the world's communications. Radiograms, commercial and social, aggregating millions of words annually, are being sent daily across the Atlantic and Pacific oceans. These are regular paid communications, filed just as cablegrams are, and delivered with the accuracy and speed so essential to the users of long-distance communication. Direct wireless service is maintained, night and day, with Great Britain, France, Germany, Norway, Hawaii, and Japan, at rates which are from four to twenty-four cents per word lower than the cable rates. Economy being the keynote of commerce, the enormous total saving effected by the use of radio in the conduct of international communications makes it a matter of vital interest to everyone, and this interest has manifested itself in the constantly growing number of countries which are adopting radio as a means of communication, and which are constructing wireless stations with which to carry on this communication direct with other countries already thus equipped.

Another great advantage possessed by radio is what might be termed its

universality, with reference to communication with several distant points at the same time. This was illustrated on the occasion of the formal opening of Radio Central, a superpowered station of the Radio Corporation of America, located at a point on Long Island about sixty-five miles distant from New York City. On November 5, 1921, President Harding threw a switch in the White House, and a message which he had prepared for broadcasting to the world ran through a mechanical transmitter and the words, carried by land wire to Radio Central, were flung into space without the intervening agency of a human hand.

The first answer came back instantly. Others followed close upon it. Acknowledgments were received from such widely scattered points as Norway, Germany, France, Italy, England, Belgium, Sweden, Canada, Cuba, Japan, New Zealand, Panama, Columbia, Costa Rica, Nicaragua, Honduras, and Australia.

This fact of the universality of radio has a further application to broadcasting through the medium of stations which are in direct communication with thousands of wireless stations maintained by amateurs in all parts of the country, and in this respect it is of especial value to isolated communities, out of touch otherwise with current happenings and with the world's progress.

This branch of the radio service has awakened a wide interest in all parts of the world, and with the rapid development of the wireless telephone, persons in remote districts, as well as passengers at sea, are privileged to listen to concerts by famous artists in the large musical centers and to hear, not the dots and dashes of the telegraph code, but the exact words of spoken addresses.

When to Be Careful

THE regenerative feature in receiving sets, when properly employed, is of great value; but improperly employed it is not conducive to the best operation. Great care should be taken in the employment of regeneration, otherwise radiotelephone speech and music may become distorted.

With proper regeneration signals should be of loud signal-strength.

The Use of Capacity in a Circuit

By George W. May, R.E.

ONE of the most useful devices in radio is the condenser. But to know the functioning of such a machine, we must first understand its elementary principles. This instrument is used to an enormous extent and comes under the term of capacity. There are thousands of radio fans and novices who do not understand its main function. Capacity is an important factor in radio work, and it is necessary to have a thorough understanding of what capacity is.

In order to be thoroughly cognizant let us take two electrical balls, or conductors, one just twice as large as the other, and charge them with electricity. Put twice as much electricity in the larger ball as you put in the smaller one. Now, if we connect two balls by a wire there will no exchange of electricity. There can be no difference of voltage between them or there would be a transfer of electricity; that is, the two balls have the same voltage. It took twice as much electricity to bring the larger ball to this voltage as it did to bring the smaller ball.

Capacity, then, refers to the ability of a body to hold an electrical charge. If the body has a large capacity it will take a large amount of electricity to raise its voltage. If it has a small capacity, it will take only a small amount of electricity to raise its voltage.

We can produce momentary currents in conductors, whether open or closed, by cutting off the lines of force. The evidences of electrification are most pronounced at the ends of an open conductor; but these disappear as soon as the cutting of lines of force ceases. We find, however, that electrification of amber, glass, silk, and other substances remain after the rubbing has ceased. We can produce static electricity on conductors by insulating them. For instance, if two metal plates separated by a piece of glass are connected, one to the positive, and the other to the negative pole of a source of EMF and then simultaneously separated from it, they will be found to be electrically charged. When two plates oppositely charged are connected through wires leading to a galvanometer, the amount of deflection of the galvanometer needle is a measure of quantity of electricity over each plate. In testing plates of different sizes, shapes, and materials, charged to the same potential by being connected to the poles of the same source of electricity, it is found that different values of the throw of the galvanometer needle are produced. Other conditions being equal, plates having the greatest amount of surface are found to have the largest capacity. The amount of

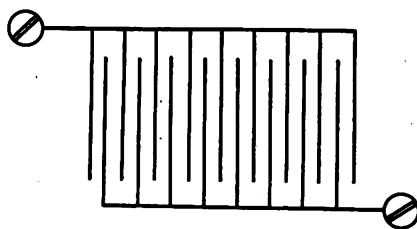


Diagram showing how a few plates would appear in a variable condenser, the white space representing the dielectric, or air.

electricity stored in an electrified body depends on its potential as well as on its capacity.

Capacity is figured in farads. A body has a capacity of one farad if one ampere of current flowing into it for one second, raises its potential one volt. This is too large for radio work, so it is divided into a million parts. Each of these parts is termed a microfarad. We must not get the idea that capacity tells us how much an object holds. This is wrong. It really tells us what potential the capacity will be raised under a given quantity of electricity. Instruments built to give capacity are termed condensers. There are various

kinds of condensers on the market, for various purposes. In using a condenser, be careful not to apply a voltage greater than that for which it is built. If you do, a spark will pass through the non-conductor and between the plates, and will ruin the condenser. A condenser will permit an alternating current to flow in a circuit, but will not permit direct current to flow. A condenser is frequently used in instruments to prevent a direct current from flowing and permitting an alternating current to flow.

Condensers are often made up of interlaced plates, or films, of conducting metal, having between them—for a dielectric—larger pieces of mica, glass, or oiled paper—alternate plates being similarly charged. Condensers are made in which the relative position of the plates and, therefore, the capacity, may be varied at will. These are called variable condensers. Other condensers are of the fixed type, and are used in various forms to make up the circuit. The variable condenser is the most useful instrument, at times, in any receiving set used by the novice. Its main function is to bring two circuits into tune or resonance.

Car Gathers News by Radio



(C. Underwood & Underwood)

How the official press car of the Chicago Pageant of Progress appeared in its radio garb. This car was equipped with a complete radio-receiving set and aerials. It kept in tune with broadcasting stations. When on a tour of the city, the officials in the car were enabled to keep in touch with headquarters and with the various newspaper offices. The radio-equipped press car proved to be both practical and economical. According to all reports it worked perfectly and added another to radio's many triumphs. The radio gear attracted attention wherever it went.

Radiograms

Latest Important News of Radio Garnered from the World Over, and Reduced to Short Wave-Lengths for the Busy Reader.

WHETHER there is any connection between the centers of electrical disturbances and the centers of storms is the subject of present experimenting by the United States Navy Department and the Weather Bureau. To help out, all radio-compass stations are taking bearings on all static disturbances three times a day.

Radio insurance is now being sold by various insurance companies. Blanket radiophone policies against fire, lighting, burglary, theft, and transportation accidents are being offered by companies in every large city.

Expert bakers baked a loaf of bread by radio at a Muncie, Indiana, food show. Perhaps baking by radio may prevent, in the future, some bolshevist from putting arsenic in pies and prevent another tragedy such as occurred in New York City recently.

German-made radio sets are to be barred in by Great Britain. The Germans, it is reported, are offering apparatus at a price that makes it impossible for the British to compete. The cheapest British-made set sells for \$23 and is guaranteed by the Marconi Company. A German set sells for \$5 with no guarantee. It claims a wave-length from 150 to 800 meters on a broadcasting wave-length of 425 meters.

The Post Office of Great Britain controls the air absolutely. Therefore, British manufacturers complained to the Post Office

Grant Transmitting Tube for Long Distances



(C. Kadel & Herbert)

In the right hand of the young man in the photograph is a 250-watt transmitting tube in his left, an average-sized vacuum tube. The larger tube is the type used by broadcasting stations for long-distance sending.

Department that Germany was about to monopolize the radio market. They claimed that business would slump if the Germans controlled the market. The British cabinet considered the matter and manufacturers were assured that the desired ban would soon be put into effect.

Every motorcycle used by the State police of Michigan will be equipped with radio if experiments now being conducted by the State Department for Safety are successful.

Inmates of the Wyandotte County Jail, Kansas, contributed their 'tobacco money' so they might purchase a radio receiving-set with a loud-speaker.

The Japanese of Los Angeles have succumbed to the radio craze. The publisher of the Japanese Daily News has applied for a broadcasting license to operate from his newspaper office.

Plows to be controlled by radio is the prediction of John Hayes Hammond, Jr. He believes that a number of "gang plows" covering a large territory may be operated by radio from a centrally located town. By this means, work that now takes weeks may be done in days.

Two hours in the daytime and four and one-half on Thursday evenings is the temporary schedule which has been assigned to WBAY, the new broadcasting station of the American Telephone and Telegraph Company. A. W. Drake, general manager, in charge of this station, says that there have been close to 100 applicants for the use of this broadcaster, and he has taken steps to arrange with these applicants to furnish programs. While radio advertising has not as yet been prohibited by laws or regulation, it is considered, in the public interest, that applicants for the use of this station should provide programs of general interest.

C. K. McHarg, supervisor of the Cour d'Alene National Forest, has announced the installation of a high-power radio-receiving station capable of intercepting messages from a distance of 3,000 miles, near Priest River, Idaho, by the United States Forestry Service.

Nicola Tesla is planning a power plant to transmit radio energy for commercial purposes. He believes that the mechanical methods of the transportation of the world will ultimately be changed when radio is more thoroughly developed.

That radio publication are being cut up and articles on radio removed, is the report of the Los Angeles Public Library. While the desire for information on radio is, perhaps, greater than for any other subject, it should not lead to vandalism.

A new radio record was announced when it was reported that for four hours a powerful sending station of the General Electric Company at Schenectady, N. Y., broadcasted a program to the Rock Ridge, California, radio-receiving station of the Atlantic-Pacific Radio Supplies Company. The musical program varied slightly in intensity, due to interference of the great magnetic terrain in the vicinity of Colorado Springs.

A Complete Chronological History of Radio

By C. D. WAGONER

IN NEXT WEEK'S ISSUE OF

RADIO WORLD

NO. 22, DATED AUGUST 26

ORDER NOW FROM YOUR NEWSDEALER
ON SALE WEDNESDAY, AUGUST 23

Radio and the Woman

By
Crystal D. Tector

MRS. GERALD H. HARRISON, an enthusiastic radio-woman, residing in Dallas, Texas, has written me an interesting letter, for which she has my sincere thanks and, in addition, I am certain, she will have the thanks of all other women who may be so lucky as to read what I quote of it and my comments thereon. Mrs. Harrison says: "We have in our home what may be only an ordinary receiving set, yet a friend of the family, who is thoroughly conversant with radio science, told us that it was sufficiently strong in reception possibilities to satisfy any family of our position. It works admirably—save on occasions when a selfish neighbor who has a powerful transmitter—he is a dyed-in-the-battery radio bug—begins to send out his 'program.' Then our peace of mind is utterly put to rout. What can we do? He is such a selfish boor that we dare not molest him, and there seems no way to quell him by law."

* * *

I read the letter aloud to Friend Husband at our Sunday breakfast. That is a particularly long-drawn-out affair with us—a goodly supply of ham and eggs, coffee, and whole-wheat toast—and we have plenty of time to discuss our "matters of State," as we call them. Being a lawyer, I put Mrs. Harrison's case up to him. We discussed it pro and con, and both came to the conclusion that there is nothing our Texas friend can do but exercise those very fine human qualities, patience and diplomacy.

* * *

We advise her to call on the selfish neighbor in person—exhibiting the sweet, womanly charm which, we judge by her letter, she must possess. No doubt, Mrs. Harrison, you will be met by a bully; but let him show just what unfortunate elements Dame Nature has assigned to his makeup. He will tell you there is no way of policing the air; that he is within his rights; that he is a radio scientist while you are but an amateur—and all that sort of thing. Listen to him without showing the slightest touch of temper, then ask him in the politest terms if he won't kindly cease in his broadcasting while you and your family are endeavoring to secure a little pleasure.

* * *

I think the man will be reasonable ultimately. Don't attempt to coerce him in any way. Don't talk about law or personal rights, or utter the woman's curse: "Just like a man!" Let your personality be your power. Write me in a few weeks and let me know how my advice—ably abetted by F. H.—works out.

* * *

I am informed that a number of ambitious young singers are anxious to sing into transmitters and have their voices broadcast. This, because one fair soprano of Pittsburgh secured a very profitable engagement from a theatrical manager who happened to be stroking through Times Square, New York, while her voice was drifting out of a loud-speaker.

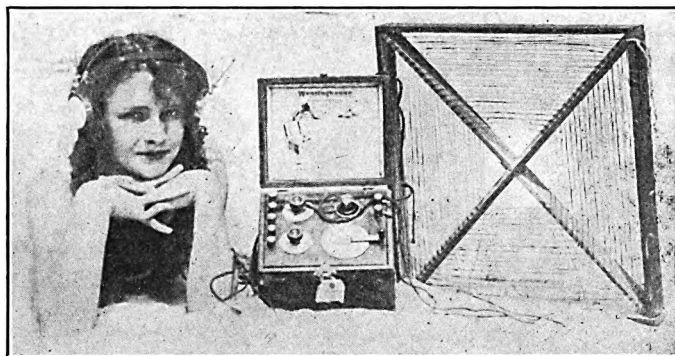
* * *

There was a dance aboard one of those big white private yachts anchored off Newport, recently. It was Saturday night, and the moon was so near full that all lights were turned off. The music came over the owners' radio equipment. A hundred couples glided over the deck. Thus a new event in the world of social affairs was recorded. Dancing by moonlight on the deck of a yacht to music furnished by radio! Verily, the times do change and we change with them.

* * *

Those escaped prisoners from some New Jersey county jail caused us all a lot of excitement—I mean we radioists up here summering at Lake Hopatcong. Half a dozen women had their sets tuned in and all—including myself—received the descriptions perfectly. We suddenly felt like so many Sherlock Holmes, and were inspired to get blood hounds and scour the circumjacent. When darkness came on, we all felt a bit "skewpy." Mother told me that I always used that word when a little child and imagined there were ghosts in my bedroom. At any rate, we felt relieved when F. H. came up from the city with the cheering news that they had been rounded up by radio and captured.

No Sad Sea Waves for Hers



(C. Underwood & Underwood.)

Miss Beryl Williams tired of the old song of the waves that beat against the old Atlantic shore, rigged up her loop aerial and receiving set and heard more entertaining things over the waves of the air.

The programs are particularly good these nights. Really we have not been troubled much by static. I feel that this bugaboo will be eliminated entirely before another summer rolls around. Radio is certainly fascinating—so fascinating that it must soon become universal. F. H. says that clever minds will work out all that is objectionable, just as they did with other great inventions and things that became necessary to the people.

* * *

Miss Clara Duggan, whose letter bears an Oregon postmark, wants to know if there will "be much of a future in radio for women." Hers is a big question and just how to answer it is puzzling to a degree. From inquiries that I have made, woman will find radio a profitable field. There will be many positions which she will fill to far better advantage than man. Women will be needed in radio factories and in radio operation just as they are an integral part of the telephone service of the country. But like all other things, radio must grow, must become standardized, must emerge from its infant state. No other industry—if I may use the word—was taken up by the people so greedily at its start. But it is developing fast and all the rough edges are being filed away by its untiring experts. There will be a big chance for young women who are prepared—who have a scientific knowledge of radio and its workings.

* * *

From my mail bag:

Mrs. J. U. T., Sandusky, O.—"We would be lost without Radio World. It is the family's Sunday reading."

Miss G. L. P., Memphis, Tenn.—"We are fast becoming a real radio city. The Birmingham station is a dandy. The other night we were entertained with a comic opera sent out from St. Louis."

Miss F. G. R., Toledo, O.—"Radio we bless with our hearts. I am speaking for my family. Six months ago father and my two brothers were forced out of work by the dull times. A long spell of idleness and terrible scrimping was broken by the three of them securing good positions in connection with radio. Now all is serene again and the future very, very bright."

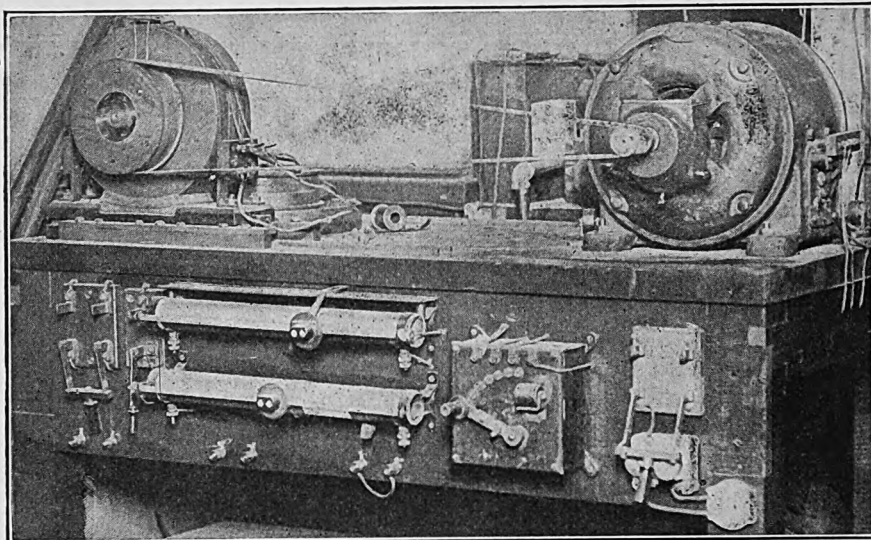
Mrs. D. T. B., Piedmont, California.—"I am writing you from across the continent; but you are responsible for getting me interested in radio. I read your department until I just had to succumb to the fever. I want to tell you now that I am glad. Radio is fascinating. Here in California we have more broadcasting stations than any other State in the Union, and the suspense of listening in as well as being able to operate your own set is truly a wonderful pastime—I'll tell the world!"

How to Make a Detector and One-Stage Amplifier

By Fred. Chas. Ehler

in Radio World (Next Week) August 26

Grave and Gay Sides of Radio as R



(C. Central News Photo Service)

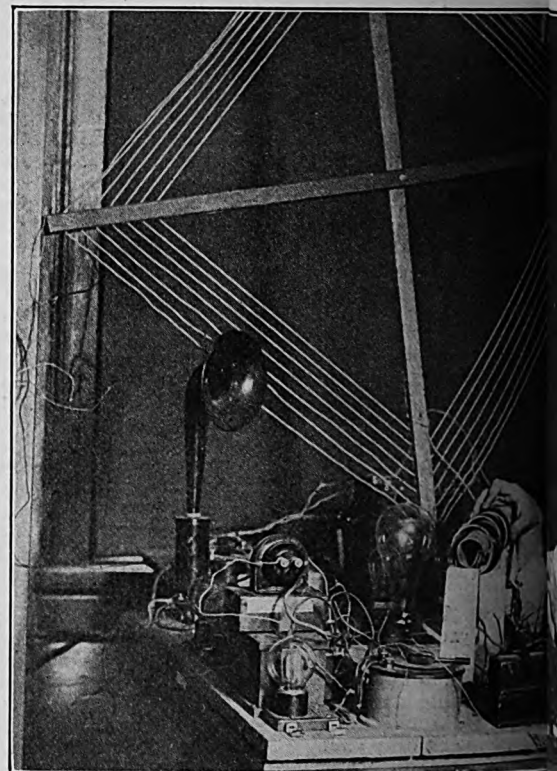
(Left) A one-kilowatt Alexanderson high-frequency transmitter, similar to this, but much larger in size, are used in radiotelegraph stations at Radio Central and the others to send messages across the ocean to Europe. But evenators are doomed to disappear and be replaced by efficient vacuum tubes.

(Left, below) Here, fans, is the man who sends out the time every day from the United States Naval Observatory, D. C. Paul Sollenberger, each day at noon broadcasts the daily signals over the country. The signals at Arlington, Annapolis, and Key West as well as the Union and Postal Telegraph stations take their time from his ambitious clock watcher. Mr. Sollenberger is the only man paid to "watch the clock"! The warships and other vessels are supplied with the correct time. The clock is kept at an even temperature.

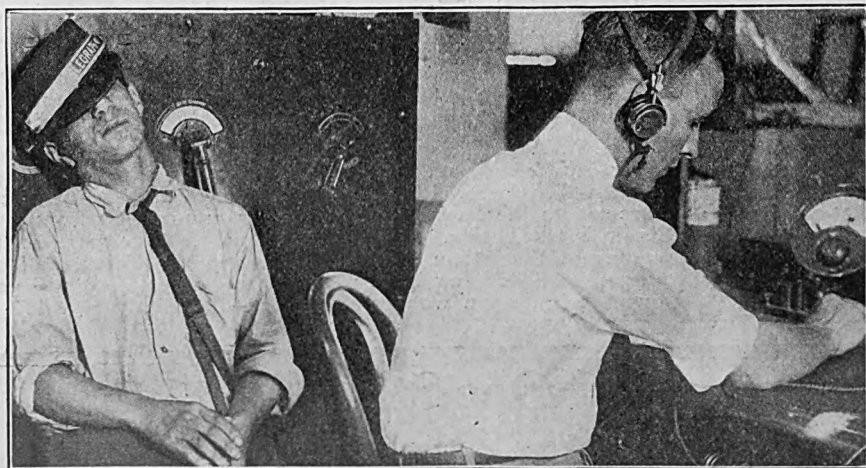
(Right) Some of the short-wave receiving apparatus at the City of New York Radio Laboratories. At the top is a standard Navy long-distance receiver, and above it a frequency amplifier employing special English vacuum tubes. To the left are a standard short-wave regenerative receiver and a three-stage amplifier is shown in center of right.



(C. International News Reel)



(C. Kadel & Herbert News Service)



(C. Underwood & Underwood, N. Y.)

(Left) Asleep on the job! No. The job is on the line. This picture is prophetic. No more will fire boys be rudely awakened, or perusal of Nick Carter's exploits interrupted to take important telegrams from one place to another. The Government through its radio service in the Post Office has set the pace by using radio instead of messengers for communications between branches wherever possible. The Post Office has fifteen radio stations in operation. The New York station handles a thousand messages a month.

(Right) This photograph was taken in the parlor of the Hotel, New York, where a number of guests assembled last night of the Leonard-Tendler fight to hear the report as received by radio. This was the first time such a place at the hotel. The room was crowded, the guests noticeably in evidence. Our photograph, however, shows the corner of the room in which the receiving set was installed. McAlpin is radio-equipped, its service, in this respect, one of its attractions.

The Radio Primer

A. B. C. for the Beginner Who Must Have the Facts Put Plainly and Tersely, and all Terms Fully Explained

The Beginner's Catechism

By Edward Linwood

FOR what purpose is the series parallel-switch used?

A series parallel-switch is used in connection with honeycomb-coil receivers. Its purpose is to throw the aerial tuning-inductance either in series with the aerial honeycomb coil or in parallel with that coil. It is necessary, when listening to short-wave stations, to have the aerial tuning-condenser in series with the honeycomb coil; when listening to long waves it is necessary to have this condenser in parallel with the coil. Its purpose is to enable a quick change from series to parallel, or vice versa.

* * *

Is there any difference between an open circuit and a closed circuit?

An open circuit and a closed circuit are the oscillating circuits that deal with the high-frequency currents used in receiving and transmitting sets. The open circuit is that part of the circuit comprising the aerial, the aerial tuning-inductance, the aerial condenser, and the ground. The closed circuit is that part of a circuit which consists of an inductance and a condenser shunted across this coil. The frequency that either of these two circuits will oscillate depends on the amount of inductance and capacity in that circuit.

* * *

Why do some manufacturers use sheeting on the rear of the panel? Is this essential, or is it put there for some purpose?

On sets, the copper sheeting between the variometers and on the panel is very essential as it eliminates all body capacity effects and should be used in every set. The sheeting should be grounded and careful attention taken that no part of the sheeting makes electrical contact with any of the wires or any part of the circuit.

* * *

Looking into a storage battery that has a glass case, can any of the plates be determined as positive or negative?

Storage-battery plates may be easily determined in a battery at a glance; that is, provided the plates can be seen. The chocolate-colored plates are positive; the plates that are steel gray in

color, negative. Usually in all batteries the two outside plates are negative while the inner plates are positive. In a battery of this type, every incident of a battery may be noticed. Buckling of plates may be detected; active material that many have fallen out and to the bottom may be seen, and the correct amount of electrolyte kept up to its limit.

* * *

How is wave length calculated?

A wave length, usually, is equal to the speed of the waves divided by the number of times they occur per second, and known as "frequency." Frequency is determined by the number of spark discharges that take place in a spark station, or by the number of vibrations or oscillations in a vacuum-tube sending set. Broadcasting waves having a length of 360 meters must have a frequency of 833,333 per second.

* * *

Would a poor ground-connection have any effect on a set so far as signals are concerned?

If your ground is poor, signals from broadcasting stations cannot be expected to be heard at any great signal strength. Signals may be so weak at times that it will be impossible to hear anything at all, which is very discouraging. When making a ground connection don't wrap the wire around the pipe or radiator. Solder all joints.

Carborundum Is Artificial

Carborundum, unlike most of the other minerals used as detectors, is artificial and is made in the electric furnace. In radio it is usually used under pressure against a piece of carbon instead of the light wire contact as used with galena. Because of the heavy contact and its hard rough surface, carborundum is commonly used by operators, since it cannot be jarred from adjustment as easily as the galena.

Radio World's Revised Radio Dictionary

By Fred. Chas. Ehler

Selectivity—In radio work, we must maintain the ability of selecting any particular wave length, exclusive from other wave lengths that may be interfering.

Self-induction—The result of the rise and fall of the magnetic field about a coil of wire which has a current flowing through it.

Series Connection—Any number of instruments so connected that current passes successively through them. A circuit having no shunts or parallel connections.

Sharp Tuning. Whenever a marked effect is obtained—when a very slight change has been made of a tuner or in a tuning system—it is termed, sharp tuning. The sharper the tuning the greater effect of selectivity.

Short Wave—Generally referred to as waves with a length of 200 meters or up to 1,500 meters. Some radio sets have a range from 300 meters to 3,000 meters and are called short-wave receivers.

Series Condenser—Used in conjunction with the antenna to adjust the system to a period of oscillation to a wave length less than the natural period of the antenna.

Silicon—A mineral used as detector in a crystal set.

Skin Effect—When high-frequency currents flow in a circuit, they travel on the surface of the conductor and are known as skin effect. This is the reason for Litz wire and stranded wire being so generally used in radio work where high-frequency currents are to be carried.

Spark Gap—A mechanical piece of apparatus that allows for the discharge of a condenser at various intervals; also to stop the flow in order that the condenser may receive a full charge.

Spark Frequency—The number of spark discharges that bridge a gap per second of time.

Specific Gravity—The density or weight of electrolyte in a battery as compared with water.

Stator—The stationary part of a variometer or motor.

Spider-Web Coils—A form of a tuning-coil wound similarly to the web of a spider. They are also termed stagger-wound inductances or coils. Very efficient for short-wave regenerative receivers.

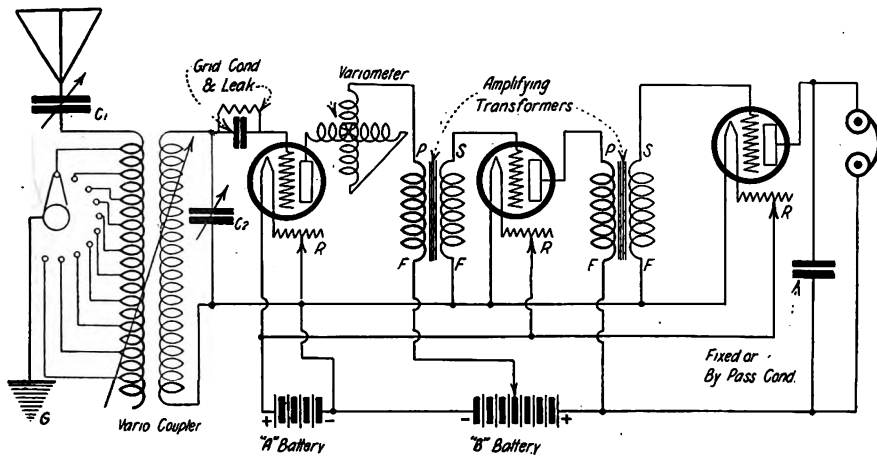
Stopping Condenser—A condenser of low voltage generally used in the detector circuit to store up the small impulses of a current in a wave train which, in turn, transmits this energy to the diaphragm of the receiver.

A Correction

The definition of "Ohm's Law" in RADIO WORLD, No. 19, dated August 5, stated that "the pressure of volts in a circuit is equal to the amperes flowing through a circuit divided by the resistance in ohms." The word *divided* should read *multiplied*.

The Radio Primer has been published regularly in RADIO WORLD since issue No. 1, and will be a regular department in order to instruct and aid the many thousands of amateurs who are joining the ranks of radio enthusiasts every week.

Answers to Readers



Schematic design of complete regenerative circuit.

I HAVE a complete regenerative variometer set with two-stage amplifier. Trouble is usually encountered, and I would like a diagram so I may look over all connections and see where the trouble may be.—Harold Trowbridge, Canastota, New York.

The schematic diagram published above covers a complete regenerative circuit. Careful attention should be given to the batteries and their correct polarities.

* * *

Can I use No. 28 double cotton-covered wire for an aerial?—Louis Hansen, Brooklyn, N. Y.

No. No. 28 wire is too small for aerial or ground leads, although this size wire could be used for laboratory connections.

* * *

How reasonably can I purchase a receiving set that would pick up Washington, D. C., Newark, N. J. and Pittsburgh? I live in a private house, and the nearest broadcasting station is about 50 miles away.—Leon Copeland, Charlotte, N. C.

* * *

Is the cost of installing a set prohibitive?—K. L. Marey, New London, Conn.

The general advice given by those who have had radio sets for some time, may be misleading in regard to what is required in the way of equipment. The cost may be, apparently, prohibitive. Actually a simple receiving-set which will copy commercial stations from a distance of 500 miles or more is quite small. If all necessary instruments are purchased, the cost should be under \$25. When made by the experimenter himself, the cost of material is less.

Experimenters who are really interested in "What it does and how it does it," find most satisfaction in mastering the details and operation of each instrument as they add to their stations. That is the way of the logical mind and, under cover of providing for real indoor sport, radio work offers to the younger minds valuable development in logical and analytical thinking—more effective than school-book methods since it is accomplished by real entertainment.

* * *

Is there any special reason for using cage antennas?—Morris Siegel, Pasadena, Cal.

Yes. Electrically they handle a given amount of energy with less rise in voltage and, therefore, have less tendency to leak from the ground than any other form. This

advantage comes especially into play when they are used as transmitters. Austin, Miller, and others have proved that trees, poles, and large insulating masses close to a station often absorb energy from a highly charged wire when the charge reverses rapidly.

Mechanical advantages are afforded by the cage antenna in wartime, as a single shot will not bring down a cage antenna because the loops distributed throughout its length separate the wires. The flat-top antenna is not protected in this manner.

* * *

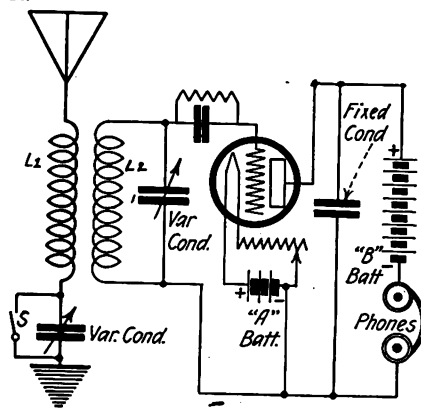
Can I use a King-amplitone-horn with my galena set?—John Morehouse, Schenectady.

You cannot use any horn with a crystal set. Whenever signals are of such volume that you can hear the music—say a foot away from the phones—then use the horn. Would suggest that you use more phones connected in the circuit so more can hear. For loud speakers or horns, tube outfits must be had.

* * *

Where is station 2AXI? Frank Gleason, Kew Gardens, N. Y.

2AXI is the experimental license call of WJZ. This call is used, as a rule, when the station is undergoing an experimental test.



A correct circuit.

Give me the proper circuit using a variocoupler, grid leak, grid condenser, variable condenser, and regular tube equipment.—John Mellinge, Forest Hills, New York.

The accompanying hook-up is self-explanatory. It shows the correct circuit using the equipment you are seeking.



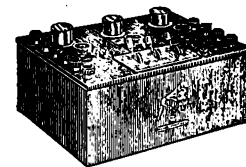
The Summer Camp is made complete by the

MAGNAVOX RADIO—

WHAT wonder that camping parties, clubs, summer schools, hotels and country homes everywhere are enthusiastically taking up Magnavox Radio to solve the inevitable problem—adequate amusement for every member or guest.

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Oakland, California
N.Y. Office: 370 Seventh Ave.

Radio Patents

RECENTLY ISSUED

Oscillator for Radio Transmission

No. 1,424,141. Patented July 25, 1922.
Patentee: Leonard F. Fuller, Palo Alto, California

MR. FULLER'S invention relates to electrical oscillation generators for use in radio-transmission systems. In oscillation generators of this character, the cathode is carbon and the anode is metal, and during the operation of the generator, when the hydrocarbon atmosphere in which the arc is formed has a high-carbon con-

Fig. 1

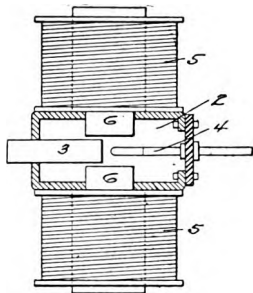
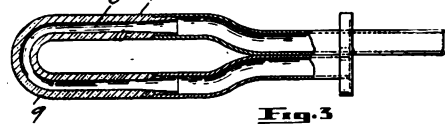


Fig. 2



Fig. 3



The three principal parts of Mr. Fuller's oscillator for radio transmission.

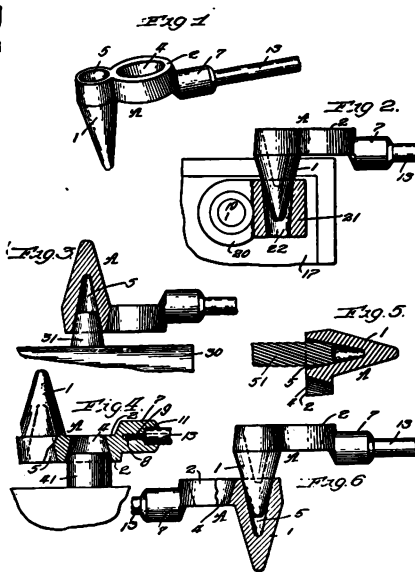
tent, carbon teats occasionally from on the end of the anode, which vary the length of the arc gap and interfere to some extent with the proper operation of the generator. On account of the great heat generated by the arc, the metallic anode is water cooled, and there is a possibility of steam pockets forming in the interior of the anode which would interfere with the proper cooling of the anode tip.

This invention is to provide a cheap, rugged and reliable anode tip for arc converters; also an anode tip which will have a minimum of carbon teats formed thereon. It will also provide a water-cooled anode tip through which the cooling water runs at high velocity close to and in direct thermal contact with the surfaces upon which the arc flame plays.

For Lighting Batteries

No. 1,421,017. Patented June 27, 1922.
Patentee: Gustave E. Lundberg, Kewanee, Ill.

MR. LUNDBERG'S inventions relates to improvements in battery connectors, and is especially adapted for use at a charging station where automobile starting and lighting batteries of different makes with different kinds of terminals are brought in for charging. One of the features of the



Five principal elements of Mr. Lundberg's invention for lighting batteries.

invention is the provision of a connector that can be easily and cheaply made, that is simple in construction and operation, and that is adapted for universal use with a large variety of battery terminals.

"It is well known that there is a great variety of automobile starting and lighting batteries, such batteries being made of many sizes and designs," says Mr. Lundberg, in his specifications. "It is well known also that the terminals on such batteries are not standardized, such terminals being made in a great variety of shapes and sizes. At a charging station where such batteries are handled in great numbers it is desirable to use a connector that is readily adapted for quick and easy connection to and disconnection from the terminals of such batteries regardless of their design or shape. I have provided such a connector that is adapted for quick and easy connection to and disconnection from a large variety of battery terminals.

"My connector can also be easily and cheaply made; and is simple in construction and operation. My improved battery connector is also adapted to be readily attached to or detached from the end of a wire cable. It is also so constructed that two of such connectors can be attached together. These are valuable features since in connection with the charging of batteries it frequently is necessary in order to get extra length, to attach two or more charging wires together. This can easily be done by taking two or more wires, having one of my improved connectors on each end, and attaching the connectors to each other, thus getting any desired length of wire."

* * *

Radioelectron Oscillator

No. 1,424,091. Patented July 25, 1922.
Patentee: Claude R. Fountain, Macon, Georgia

DESCRIBING his invention, Mr. Fountain says:

My invention relates to radioelectron oscillators, and consists in such an oscillator as affords a double control by means

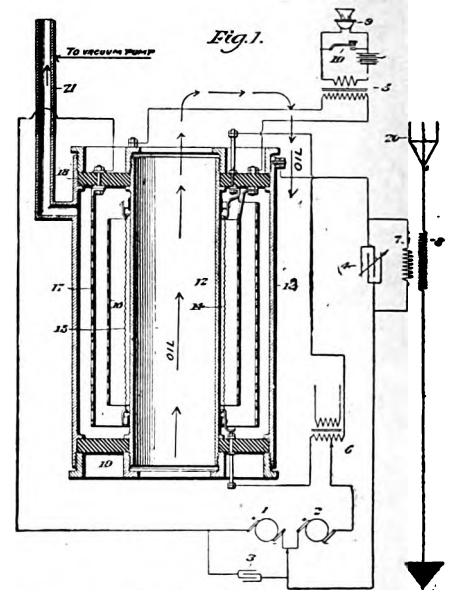
of a medium, preferably a grid, in front and a medium, preferably a cylinder, behind a common source of electrons; both operating in concert to change the speed or direction of the electrons which are being emitted at their common source and are attracted toward other media.

This invention relates especially to that type of electron oscillator wherein secondary electrons are emitted by the impact of rapidly moving electrons upon other media.

The essential elements for this latter type of the invention include a common source of electrons, two control elements, one on either side of this course of electrons, a perforated medium strongly attracting electrons, and another medium capable of liberating electrons under violent electronic impacts.

The number of these liberated, or secondary, electrons determines the amount of current in the oscillating circuit of the ordinary transmitting station.

There are provided also means for insulating the various elements from one another—means for keeping the space between



Mr. Fountain's radioelectron oscillator for handling an unusually large output of energy.

the elements in a highly vacuous state, and means for keeping the device from becoming too hot.

A primary object of this invention is to provide a radioelectron oscillator capable of handling a very large energy output. A further object is to provide a simple means for controlling this energy output.

In the installation of my oscillator, which I denominate a radiotron, there may be used any of the standard methods of combining an oscillator with capacities, inductances, antenna, electric generators, batteries, etc., for the radiation of electromagnetic waves.

It May Be Radio

IN its editorial comment on the death of Alexander Graham Bell, inventor of the telephone, "The World," New York, said:

"Beginning as a novelty, spreading as a convenience or a luxury, the network of wires has permeated the very warp and woof of our social fabric, has grown into it, has grown with it, until there is not a resident of any city in this country who is not enmeshed. If there is ever to be a disentangling, it must come through another invention superseding that of Dr. Bell, perhaps dispensing with wires and even with central operators."

We repeat, it may be radio.

R. A. Heising Perfects Modulator

WHEN the three-electrode audion or vacuum tube, the invention that made radio telephony possible, came into being along in 1912, it set to working the mental machinery of Reginald A. Heising, a young physicist, thirty-three years old, working for a degree as Master of Science in the University of Wisconsin.

Mr. Heising's photograph was published in "Radio World's Hall of Fame," RADIO WORLD, No. 18, dated August 5. "If I could put into a vacuum tube the amount of energy produced by the voice and get it out many times amplified in the form of high frequency power in an antenna, what an advance it would be," thought this young scientist.

Armed with his degree, he went to work on this problem in the research laboratories of the Bell System operated by the Western Electric Company. Six weeks after he started, his first patent establishing the basic principle of the Heising modulation system was applied for. Since that time he has been engaged in perfecting the discovery. How well he has solved the problem was proved by the award, in 1921, to him of the Morris Liebmann Memorial prize by the Institute of Radio Engineers. This is the highest tribute which the radio fraternity can bestow upon a fellow scientist.

In the communication field, to-day, the Heising system of modulation is a fundamental law, and the young inventor whose work in research brought it about holds an enviable position in the world of scientific achievement.

Radio Big Factor in Gas Consumption

GAS is an important factor in the manufacture of telephone apparatus. The heat required in the production of the delicate apparatus used in the communication systems of the world, and in radio broadcasting equipment, makes necessary two of the largest privately operated gas-tanks in the country. These are owned by the Western Electric Company which, in its manufacturing plant at Chicago, uses, daily, enough gas to supply a city of from 80,000 to 100,000 inhabitants. This immense amount of gas is consumed entirely in productive operations requiring exceptionally high temperatures, none whatever being used for generating power or for heating buildings.

The applications of gas in telephone and radiotelephone manufacturing are many and diversified. It heats the large ovens in the foundries, it softens the glass used to make switchboard lamps and vacuum tubes, it heats the lead presses which put the heavy lead coating around miles and miles of telephone cable every day, it softens iron in the annealing ovens and hardens it in the tempering ovens, it heats beakers and crucibles in the chemical laboratory, and it performs a thousand and one other tasks in the big works.

The Chicago gas plant is operated 24 hours a day in three eight-hour shifts, and is equipped to send out 135,000 cubic feet of gas an hour under peak load conditions. The usual maximum is about 105,000 cubic feet an hour, and at times the output reaches one and a half million cubic feet per day.

Latest broadcasting map 15c. That is, a complete broadcasting map appeared in Radio World, No. 8, dated May 20. Mailed on receipt of 15c. Radio World Company, 1493 Broadway, N. Y. C.

Subscribe for Radio World, \$6.00 a year, \$3.00 six months, \$1.50 three months.

Remington Terminal Indicators

5 CENTS EACH



Type A



Type B

A perfect panel engraving imitation. Fits any binding post. Black japanned, white enameled letters. Supplied in the following: Antenna, Ground, Phones, Grid, Input, Output, A Bat +, A Bat -, B Bat +, B Bat -. Lettering in two positions. Order direct from ad.

Dealers! Write for Discounts!

REMINGTON RADIO CORP., FRANKLIN, MASS.

REMOVAL NOTICE

THE ALLIED RADIO CORP.

Manufacturers of

PANELS

NOW AT

445 SEVENTH AVE.
NEW YORK

FREE

Testing sample of A. R. C. PANEL of hard rubber composition manufactured according to U. S. Navy specification, stands 74,000 ohm resistance, does not warp, drills without a burr. It is highly polished and costs about 1/3 less than other panel material of equal standard. We carry three standard sizes in stock. 7x10x3/16-7x10x3/16-12x14x3/16. Send for your testing sample free and special prices in quantities desired.

SPECIAL INTRODUCTORY

BARGAIN

DICTOGRAPH HEADSET \$9.00

3000 ohms \$12 value

DEALERS WRITE

**CENTRAL-KANSAS
RADIO WHOLESALE CO.**

LYONS, KANSAS

ADVERTISING SOLICITOR WANTED

High-class advertising man, acquainted with agencies, wanted by successful radio weekly. One with experience on radio or electrical publication preferred. Give full details as to past experience and salary or commission expected. Letters will be held in strictest confidence. Address: Publisher, 30 Fifth Ave., New Rochelle, N. Y.

Advertising Rates, Display, \$5.00 per inch, \$150.00 per page

Radio Merchandising

Classified Quick-Action Advertisements, 5 cents per word

Telephone Bryant 4796

The Demand Is for STANDARD Radio Goods

By Fred S. Clark, Manager Radio World

WHAT are STANDARD goods? Standard goods are goods that are known, that have a name back of them; in short, standard goods are advertised goods. No man can afford to brand and advertise goods that are not right. The profit in advertising is not in the first sale. It is in the repeat business. The pleased, satisfied buyer who "comes back," buys again and recommends the brand to others, is the only buyer in whom there is a REAL profit.

The other day, an advertising solicitor asked me for a position on RADIO WORLD'S advertising staff. Yes, he was still working on a radio trade paper. He went on to prove what a successful solicitor he was by pointing out the large number of advertisements his paper was carrying, due to his efforts.

I asked him if he were doing so well, why change to another paper? This was his answer:

"Every time I sign up a manufacturer to advertise in a dealer publication I feel as though I were robbing him. Even if the advertisement brings orders, stocking the dealer up with 'shelf warmers' doesn't get anybody anywhere but the poorhouse. Just loading up the retailer isn't putting goods into consumption. Dealer publications create no consumer demand.

"When a manufacturer advertises in a 'fan' publication, like RADIO WORLD, then and only then is the manufacturer creating a demand for his goods—he is then talking to the thousands of real buyers—the consumers; he is building up a name, standardizing his brand, and getting somewhere.

"The man who puts an inch advertisement in a 'fan' publication, eventually becomes a page advertiser; but as long as I work on a dealer or trade-radio publication of limited free dealer circulation, I've got to keep looking for new advertisers all the time."

He said just that!

Personally, I think about advertising as the old Kentucky Colonel did about whiskey, i.e.: "All advertising is good, only some is better." The market has been flooded with radio goods thrown together by inexperienced workmen. In the boom and rush of last spring, most anything would "get by." Today it's quite different. The burnt child is twice shy—radio buyers want to know more about the goods they spend their good money for. "Who Made Them?" Tomorrow the buying public will be demanding STANDARD radio goods—goods backed by manufacturers they know, a name they have seen and become familiar with through their continued advertising in the "fan" papers they read. That's why I think you will see a continued increase in the advertising in "fan" radio papers like RADIO WORLD, and a mortality in the dealer, or radio trade papers, whose circulation is necessarily very limited, and mostly given away. The results from FREE circulation has always been poor.

J. H. Cross Co., general advertising agents, of Philadelphia, is so convinced of the value of the consumer argument that they take a page in "Printers' Ink" to say so. Here is the Cross argument:

"We believe in consumer demand. We write copy—founded on a basic sales idea and forcefully expressed—that creates demand. And the sooner the business world forgets about 'consumer acceptance' and freak merchandising stunts, the better, we think, will business become. Sell the consumer—the trade will follow."

New Firms and Corporations

Notices in this department are considered as purely interesting trade news and published without compensation to us. We welcome trade news of this nature. All notices having an advertising angle are referred to our Advertising Department, and are placed under Classified Advertising at 5 cents a word, or as Display Advertising at \$5 an inch.

(The firms and corporations mentioned in these columns can be reached by communicating with the attorneys, whose addresses are given whenever possible.)

Bell Radio Corporation, 1913 Fifth Ave., N., Birmingham, Alabama.

Radiofone Sales Co., 410 Industrial Bank Bldg., Hartford, Conn.

Premier Equipment Radio Co., 21 East Van Buren St., Chicago, Ill.

Eclipse Radio Co., Geneva, Kane Co., Ill.

New Orleans Radio Electric Shop, 609 Commercial Place, New Orleans, La.

Master Machine & Radio Co., 4205 Third St., Detroit, Mich.

Radio Shop, F. C. Neiman, North Ave. and 35th St., Milwaukee, Wis.

Beaumont Radiophone Co., Inc., 114 North Juniper St., Philadelphia.

The Falls Radiophone Co., 710 Fourth St., Niagara Falls, N. Y.

Acme Radio Supply Co., 8 West Canal St., Cincinnati, O.

Columbus Radio Parts Co., 195 East Long St., Columbus, O.

EstTee Radio Co., 1810 Commerce St., Dallas, Texas.

The Radio Store, First and Howard Sts., Spokane, Wash.

Prima Radio Corp., Del., 50,000 shares preferred stock, \$10 each; 5,000 common, no par value. (G. Klumpp, 185 22d St., Brooklyn, N. Y.)

Mack Radio Mfg. Co., Bronx, \$10,000; M. Goldfarb, M. Etman. (Attorney, A. Chalice, 111 Broadway, N. Y.)

American Radio Phonolamp Corp., New York, manufacture lamps, \$2,200,000. (U. S. Corporation Co., Dover, Del.)

Radio "Sherlock Holmes" Locates Trouble

NED LAWRENCE, writing in the Los Angeles "Herald," tells of the self-imposed detective activities of a radio fan whom one interference too many rendered desperate. He fitted up his automobile with a small antenna on top of the car, adjusted his head-phones, tuned his set to the disturbing signals and started on his way. He circled about in his territory, moving always toward the point where the interference seemed most pronounced. Finally he would locate the signals in a comparatively small area, and then would pursue subsequent investigations until he located the origin of the disturbance.

In these experiments he traced the trouble to a faulty transformer on the electric-power wire, to a high tension wire which had rubbed against the branch of a tree, and in the third instance a small boy's attempt to build binding posts located to conform to the two sets on the adjacent edges of the tuner and detector panels, so that the temporary insertion of radio-frequency amplification is quite simple.

LAST MINUTE RADIO NEWS!

Radio apparatus exported by the United States during the month of May was valued at \$25,000, according to the Bureau of Foreign and Domestic Commerce, Department of Commerce. Ten thousand dollars' worth of American-made apparatus was shipped to Japan. Australia, Canada and New Zealand bought \$5,000 worth each.

Lewis Nixon, naval architect and former chairman of the Public Service Commission of the State of New York, has sailed for England with a radio set which, he asserts, will revolutionize reception. He claims that his set, without an aerial, will equal the best efforts of much larger apparatus.

The first wireless lighthouse has been erected off the east coast of Scotland, on the island of Inchkeith, and its operation during the experimental period indicates that it will remove one of the last terrors from navigation. It is designed on the principle of reflected waves outlined by Guglielmo Marconi. The exception is that the reflector revolves in the same manner as the reflector of an ordinary lighthouse.

E. F. W. Alexanderson, chief engineer, Radio Corporation of America, is visiting his native country, Sweden. In an interview with the Stockholm press, Mr. Alexanderson explained that only an extremely limited number of trans-Atlantic radio stations could be operated successfully without serious interference. He said that various countries already had reserved most of the wave lengths suitable for trans-Atlantic communication, and only a few were left.

The new radio station at Sainte Assise, begun last year by the French Government but taken over and completed by a private company, which will permit the simultaneous sending of from five to six messages to points outside of Europe, is ready for operating. It is for commercial traffic between France and the United States, and at 700 amperes gives an efficiency 50 per cent. greater than that of the Bordeaux station. "Commercial rush" messages will be sent at faster than 100 words a minute, giving an average of more than 30,000 words an hour. It will reach all receivers throughout the world. Ste. Assise has requested that its complementary station in America be the Radio Corporation plant at Marion, Mass.

Telephone communication by radio will be opened across the Chosen Strait the early part of this month. The stations at Fukuoka and Fusan contain the necessary equipment. It is expected that shipping along the coasts of Kiushu and Chosen will take advantage of this service. This particular installation is a unit in the government plan for linking up the various islands of the Japanese Empire by wireless telephone and telegraph.

According to Commercial Attaché Feely, no laws have been passed to govern wireless telephony in Argentina, but a bill is being drafted for presentation to the next Congress to regulate the use of radio sets. There are no regulations in effect at the present time to prevent the sale of broadcasting and receiving sets. The latter are being manufactured to some extent locally, but are of very inferior quality and sell at from 200 to 700 pesos. (The Argentine peso is worth about 96 cents in United States coin.)

de Forest
RADIO
"The Standard of Dependability"
DeFOREST RADIO TEL. & TEL. CO.
JERSEY CITY, N. J.

Delaware Now Has a Broadcasting Station

THE first licensed radio transmitting set in the State of Delaware has started operations at the broadcasting station of the Wilmington Electrical Specialty Co., Inc., 705 Adams Street, Wilmington. This is the first station in the State to receive a Federal license and the only station to have a range sufficient to reach Philadelphia and surrounding cities.

One of the largest broadcasting sets in this part of the country is now operated by Willard S. Wilson, president of the company, the above address being his home. He is a licensed operator for the company's station. The set, which was built by the local radio corporation, is equipped with four bulbs for transmission of 50-watt power. This enables the station to have a range of from 75 to 150 miles, varying according to the time of day. At night the maximum distance can be reached, as at that time there is less interference than at any other time.

Following the first program (a concert) the company received telegrams and phone messages from a radius of 100 miles, from people who had heard the test. The program had come in clearly and strong.

The present plan is to put on daily a program of home talent, singers, speakers, orchestras, bands, and soloists. A religious program will be given on Sundays.

AGENTS

Wanted in every city and town to sell radio apparatus. Good commissions. A few stocking agencies open to reliable parties.

DELANCEY, FELCH & COMPANY
13 Meeting St. Pawtucket, Rhode Island

RADIO SUPPLIES— RADIO SUPPLIES

We carry a full line of Radio Goods
Dictograph Head Sets, Vario
Couplers, Everett Head Sets,
Variometers, Transformers,
1700 Meter Loose Couplers,
Dials and Knobs.

Send 50c for 20 Blue Print
Hook-Ups

Radio Sets Made to Order
SUNBEAM ELECTRIC CO.
71 3rd Ave., New York City

Radio Set Complete

Enjoy Daily Concerts, Weather Crop
and Sporting News

Complete Outfit **\$12.75**
Including 2,000-ohm Phones
Immediate Shipment.

Can be installed in 30 minutes
by any one.

Full instructions with each set.
Send check or money order to

F. L. MARVIN & CO.
286 Woolworth Bldg. New York
Selling Agents Wanted.

YOU NEED THESE—

To Complete Your

**ARMSTRONG
SUPER-REGENERATIVE
CIRCUIT**

We have for immediate delivery:

5 M. H. Choke Coils.....**\$2.50**
100 M. H. Choke Coils**\$3.00**
12000 Ohm Resistances.....**\$3.00**
.005 MFD Tested Condensers.....**.75c**

The above parts have been tested in our
Demonstrating Set, and are made of the
best material and guaranteed.

SEND CHECK OR MONEY ORDER—
MONEY WILL BE REFUNDED if the
material should prove defective after 6 days'
trial.

Durham & Company

RADIO ENGINEERS
1936 Market Street
PHILADELPHIA, PA.

Radio World, 52 issues, \$6.00.

Subscribe direct or through your
news dealer. \$6.00 a year, \$3.00 six
months, \$1.50 three months. Radio
World, 1493 Broadway, N. Y. C.

The Nelson Radio Parts Co.

Manufacturers and Distributors of

RADIO APPARATUS

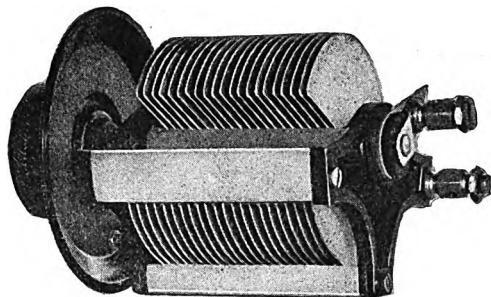
Write for Catalog.

89 ACADEMY STREET, NEWARK, N. J.
Tel. Market 4066

Buy Your Radio Receiving Set at Manufacturers' Cost

Buy your Radio Supplies at a large discount below the list or retail price. If a saving of \$15.00 to \$140.00 on a Radio Receiving Set or if a saving of 25% to 40% on Radio Supplies interests you, write or telegraph us today.

KING RADIO MFG. COMPANY
521 Penn Ave. Wilksburg, Pa.



THE BAYLEY VARIABLE CONDENSER THOROUGHLY INSULATED

The 43 plates are assembled as a solid integral part of the whole, by the die cast process. Impossible for any plates to loosen in service. This is the condenser you need. Of good and pleasing design and high class workmanship, long bearings, insure true running. No side last. Binding posts are drilled, and have tightening screws, lock nuts, and soldering points. Three ways to hook up. 3 inch dial and knob, with recessed white enameled de-

grees on black ground. Diagram label for panel, to show where to drill holes for spindle and screws, insuring perfect registration with condenser without injuring the panel board.

Packed in strong box

Complete with dial **\$4.50**

Dials, 1/4 Shafts **75c**

MONEY BACK GUARANTEE IF RETURNED IN SAME CONDITION AS WHEN RECEIVED WITHIN 10 DAYS.

To Jobbers and Dealers, We Offer a Splendid Proposition

Write for Particulars to

BAYLEY CONDENSER COMPANY

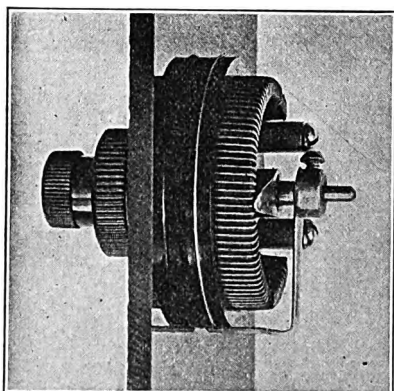
105-109 VANDERVEER STREET

BROOKLYN, NEW YORK

Telephone: 6500 Glenmore

Improved Vernier Rheostat

An absolute necessity in the new Armstrong
Regenerative and in Radio Frequency
Amplification



VERNIER

With Dial\$2.00

Without Dial\$1.50

REGULAR

With Dial\$1.50

Without Dial\$1.00

*We are the only manufacturers
selling a regular rheostat with dial
for \$1.50.*

MAXIMUM DISCOUNT TO DEALERS

THE TECo RADIO CO.

P. O. Box 3362, Boston, Mass.

Factory: 165 High St., Waltham, Mass.

The 43 New Broadcasting Stations Licensed Be- tween July 24 and August 5, 1922

- WIAN—Chronical & News Pub. Co., Allentown, Pa.
- WIAQ—Chronicle Publishing Co., Marion, Indiana.
- WIAF—Gustav A. DeCortin, New Orleans, La.
- KFBE—Reuben H. Horn, San Luis Obispo, Cal.
- WJAD—Jackson's Radio Engineering Laboratory, Waco, Texas.
- WIAQ—Matthews Electric Supply Co., Birmingham, Ala.
- WIAD—Ocean City Yacht Club, Ocean City, N. J.
- WHAW—Pierce Electric Co., Tampa, Florida.
- WIAF—J. A. Rudy & Sons, Paducah, Ky.
- WIAQ—School of Engineering of Milwaukee, Wis.
- WIAL—Standard Radio Service Co., Norwood, Ohio.
- WHAV—Wilmington Electric & Specialty Co., Wilmington, Del.
- WIAE—Mrs. Robert E. Zimmerman, Venton, Iowa.
- WJAB—American Radio Co., Lincoln, Nebraska.
- WIAS—Burlington Kawkeye, Home Electric Co., Burlington, Iowa.
- KPAV—Cooke & Chapman, Venice, California.
- KFAW—The Radio Den, Ashford & White, Santa Ana, Cal.
- KFBF—F. H. Smith, Butte, Montana.
- WJAE—Texas Radio Syndicate, San Antonio, Texas.
- WIAU—American Security & Savings Bank, Le Mars, Iowa.
- WJAG—Huse Publishing Co., Norfolk, Nebraska.
- WIAT—Leon T. Noel, Tarkio, Mo.
- WJAC—Rodoll Co., Joplin, Mo.
- WIAW—Saginaw Radio & Electrical Co., Saginaw, Mich.
- WJAJ—Y. M. C. A., Dayton, Ohio.
- WIAQ—Capital Radio Co., Lincoln, Neb.
- KFBG—First Presbyterian Church, Tacoma, Wash.
- WIAV—New York Radio Laboratories, Binghamton, N. Y.
- WKAA—H. F. Paar & Republican Times, Cedar Rapids, Iowa.
- WKAC—Star Publishing Co., Lincoln, Neb.
- WJAK—White Radio Laboratory, Stockdale, Ohio.
- WIAV—Woodward & Lothrop, Washington, D. C.
- WJAM—Central Park Amusement Co., Rockford, Ill.
- WIAZ—Electric Supply Sales Co., Miami, Florida.
- WJAP—Kelly-Duluth Co., Duluth, Minn.
- WKAD—Charles Loeff, East Providence, R. I.
- WJAR—The Outlet Co., Providence, R. I.
- WJAN—Peoria Star & Peoria Radio Sales Co., Peoria, Ill.
- WJAX—D. M. Perham, Cedar Rapids, Iowa.
- KDZT—Seattle Radio Association, Seattle, Wash.
- WJAL—Victor Radio Corp., Portland, Me.
- WKAQ—W. S. Radio Supply Co. & Wm. Schack, Wichita Falls, Texas.

52 Weeks for \$6.00

Complete Your File of **RADIO WORLD**
Copies of Radio World No. 1

If you did not get a copy of Radio World No. 1, send us \$6.00 and we will send you this paper for one year, and start it with our first issue, which will be mailed you as soon as possible after receipt of order.

Rocky Mountain Crystals

BETTER THAN GALENA
The most sensitive mineral rectifier known. Can also be used with one or more stages of amplification.
Mounted, 35c.; Unmounted, 20c.; Postpaid
Manufacturers, Jobbers, Dealers, Clubs,
Apply for Special Trade Prices

Rocky Mountain Radio Products, Inc.
9 CHURCH ST., NEW YORK, N. Y.

No Aerial No Loop
No Lamp Socket Attachment

ONLY—

RADIO-DUCT

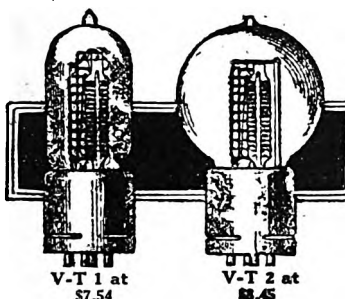
—AND A GROUND CONNECTION

Sold in 10-Foot Rolls
At \$1.00 per Roll

IF YOUR DEALER HAS NOT
GOT IT WE WILL SHIP
DIRECT UPON RECEIPT OF
YOUR REMITTANCE.

Columbia Electric Motor Co.

1414 ADAMS STREET
HOBOKEN NEW JERSEY
Telephone: 3731 Hoboken



These are the Tubes for which so many are inquiring and that are still difficult to find anywhere. There being very few of these tubes on the market, and after present supply is exhausted, more will not be available at any price, as they are to be made exclusively for the U. S. government, sure long life.

FULL LINE OF SUPPLIES. LOWEST PRICES ON STANDARD MERCHANDISE. GET OUR PRICES BEFORE PLACING YOUR ORDERS.

Amalgamated Radio Supply Co.
EXPORT AND IMPORT

103-A William Street New York City

Speed of Radio Waves

EVERY amateur or other radio operator, when sending out a message, may rest assured that his signal has reached Mars in a little over four minutes, if the planet happens to be at the nearest point of its circuit or in about twenty minutes if it is at the opposite side of the sun, says "The American," New York. Whether or not there are intelligent beings, conversant with radio, inhabiting the planet, is a question that does not for the moment concern us.

Such speculations are of interest because they bring vividly to mind the fact of the almost unthinkable speed of the electromagnetic waves that convey the radio messages. One way of illustrating this is to compute that the radio waves would go clear round the earth at the equator more than seven times in a second. In the thousandth of a second they reach out to a receiving station 186 miles away. In the hundredth of a second they would compass 1,860 miles—half across the continent.

Meantime sound travels through the air to a distance of only a little over ten feet in the hundredth of a second. And so a curious paradox presents itself. If you were in the broadcasting room, over there in Newark, let us say, listening to a speaker who was talking into the microphone transmitter, the words would not come to your ears until later (by the fraction of a second) than the time when they had been heard by every one of the listeners using radio-receiving telephones within a radius of a hundred miles.

When President Harding delivers an open-air address which is radiophoned from the great transmitting station at Arlington, the persons within actual sound of his voice—those in the audience directly in front of him—are the very last ones to hear what he says.

If he were speaking through a megaphone that would carry one-third of a mile, the members of the audience at that distance would hear his words at just about the same instant when the message reached the man in the moon.

Radio in Department Stores

THE installation of a broadcasting station in a community where as yet no other store or organization has one creates a tremendous amount of prestige and is of exceptional advertising value. It must be understood that, for the present, no direct advertising may be sent through a broadcasting station. The United States Government is issuing licenses for stations sending out only educational and recreational programs. However, in making each announcement on your radio program you are privileged to give the name of your station and its location. It is also possible to have members of your organization, or outside experts, talk on various matters of general interest which, incidentally, tend to bring business to your store. Thus, you can have your fashion expert talk on style, or have your shoe buyer talk on shoes and their effect on health, or in other words develop programs that suggest to the minds of the listener that your store is the logical center for certain lines of merchandise and for others of an associated nature.

To many anxious inquirers, RADIO WORLD has no free list. One copy is sent as a voucher to each advertiser or advertising agent represented in current issues. All other copies are paid for on subscription or through the news trade.

BUY "RITE"

\$5.00 Variometer	\$3.20	
\$5.00 Variocoupler	3.20	
Firth S. C. Jack .....	.75
Rite Rheostat .....	.75
Klesner Rheostat	1.00	
Rite Detector Units	5.50	
Rite Amplifier Units	11.95	
1250 Honeycomb Coil	3.30	
1500 Honeycomb Coil	3.50	
CRYSTAL RECEIVER complete—Aerial, Lightning Arrestor—Phone, ready to operate		20.00

Dealers write for Catalogue

"RITE" RADIO SHOP

4th Ave. and Pacific St., Brooklyn, N. Y.
Sterling 8513

Radio Trade Directory

National CARD CATALOG of
Radio Dealers, Distributors,
Jobbers, Indicating Class as
Exclusive, Wholesale, etc.

Compiled from Information Secured from
Chambers of Commerce, Manufacturers, etc.

Circular and Sample Cards upon Request.

**SYDELL'S RADIO DIRECTORY
AND SERVICE**

555A Schenck Avenue Brooklyn, N. Y.

**GITHENS TRUTONE RADIO
HORN—LOUD SPEAKER**

First one to sell
on ten day trial
Money back
Guarantee

Retail Price

\$21.00

Includes

Loud Speaker

Trutone has been pronounced the best on the market by experts. It has a clear true tone. Every radio fan should try Trutone and compare it with others.

If YOU don't find Trutone the best, your money will be refunded. It is sold on a ten-day trial money-back guarantee. If not carried by your dealer write us.

Distributors and Dealers, write!

AUTO PARTS MFG. CO.

1515 Trombly Ave., Detroit, Mich.

Let The World Talk To You
Thru The Marvelous

PAN-AUDIO

TYPE CF-3 AMPLIFIER

THE PAN-AUDIO Three Stop Amplifier was designed by expert radio engineers for those who demand the maximum of high frequency, scientific construction, appearance and workmanship in radio apparatus.

The PAN-AUDIO is absolutely free from all howling and distortion. Unlike the average amplifier, it reproduces speech in natural tones, every word of which can be clearly understood.

The PAN-AUDIO Amplifier provides a high class radio outfit, noted for its simplicity of operation, cleanness of tone and handsome appearance. It is the ideal set for receiving the broadcasting of music, lectures, concerts, time signals, news items, stock reports and weather forecasts.

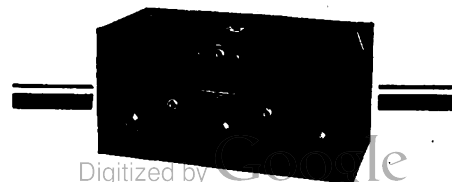
The PAN-AUDIO is made of solid mahogany, hand rubbed to a furniture finish. The panels are of best grade bakelite, carefully engraved, with nickel-plated binding posts and invisible wiring. May be used with any type of receiving set.

Ask your dealer to show you the PAN-AUDIO today. If he hasn't got it write us direct for illustrated literature and full details.

The Wireless Appliance Corporation

513-C Sixth Avenue

New York

**NOVO
"B"
BATTERIES
FOR RADIO**

22½ - 45 & 105 VOLTS



**NOISELESS
DEPENDABLE
GUARANTEED**

ASK YOUR DEALER

NOVO MANUFACTURING CO.

424-438 W. 33rd ST.

NEW YORK

531 SO. DEARBORN ST., CHICAGO.

HOMCHARGE YOUR BATTERY for A Nickel

No muss, trouble, dirt—no moving of batteries—loss of time—no effort on your part—no technical or professional knowledge needed.

THE HOMCHARGER

successfully meets all charging conditions, and is the only rectifier combining the following essential Homcharging features:

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BRANCH OFFICES—New York, Chicago, Pittsburgh,
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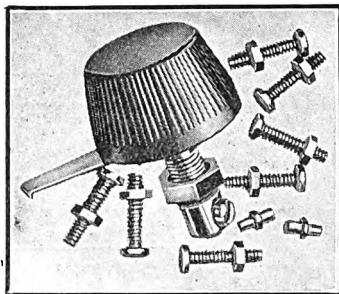
Value of Radio in Wartime

THE anniversary of the beginning of the Great War, eight years ago; will suggest to many minds the peculiar problems and difficulties of that period, which could so much more easily have been met with the aid of radio broadcasting; says "The Globe," New York; at least it is quite certain that in any future similar period of agitation a new and effective instrument will be at hand to meet those problems. It will be recalled, for instance, that great internal difficulties were created by the impossibility of imparting neutral facts to millions of our foreign-born population. Many of these could not read English. Others, and with them many Americans, thoroughly distrusted the various news sources, in most cases unjustly, perhaps, but in many cases with all too much reason.

Broadcasting would not, of course, remove all such mistrust, but it would allay a great deal of it if the source of the spoken news were definitely known to be official rather than private. The difficulties due to illiteracy or inability to read English would be overcome to even a greater degree. Broadcasting could supply the means for progressive education, trustworthy information, and finally, if needed, patriotic propaganda among many diverse elements of the population.

It is to be hoped that the uses of the radio will always hereafter be peacetime rather than wartime ones; but in the latter event we may well believe that it will serve to decrease the dissension within and to increase the fighting efficiency at the front.

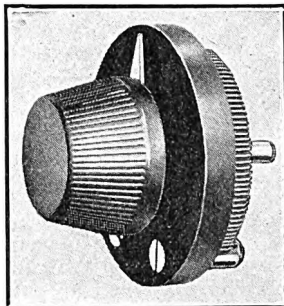
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Coming Events

The editors of RADIO WORLD will gladly publish news items of all contemplated radio shows and expositions. Keep us posted by mailing full information.

ANNUAL SHOW OF THE ST. LOUIS RADIO ASSOCIATION, St. Louis, Mo., October 4 to 7, inclusive.

CHICAGO RADIO SHOW, Coliseum, Chicago, Ill., October 4 to 22. U. J. Hermann, managing director, 549 McCormick Building.

INTERNATIONAL RADIO EXPOSITION, Grand Central Palace, New York, December 21 to 30.

KANSAS RADIO EXPOSITION will be held at the Kansas State Fair, Hutchinson, Kansas, September 16 to 22, inclusive. A. L. Sponsler, secretary.

MERCHANTS' COOPERATIVE ADVERTISING AGENCY RADIO SHOW, Robert Treat Hotel, Newark, N. J., October 4 to 7, inclusive.

"RADIO DAY," Pittsburgh, Westview Park, August 24. Under auspices of Radio Engineering Society. C. E. Urban, secretary.

RADIO CLUB OF AMERICA. First autumn meeting will be held the last Friday in September. Renville H. McCann, secretary, Columbia University, New York.

CLEVELAND RADIO AND ELECTRICAL EXPOSITION, Cleveland Public Auditorium, Cleveland, O., August 26 to September 4, inclusive.

CINCINNATI RADIO-AND-ELECTRICAL EXPOSITION, Music Hall, Cincinnati, O., October 7 to 14, inclusive.

NEW YORK ELECTRICAL AND INDUSTRIAL EXPOSITION, Grand Central Palace, New York City, October 7 to 14, inclusive.

No Free List

RADIO WORLD has no free list. The only copies sent out by the publishers are to fill the ever-increasing orders of the American News Company, the large numbers of subscription orders received at the office of publication, and one voucher copy to each advertiser and advertising agent represented in current issues.

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The rate for this RADIO WORLD QUICK-ACTION CLASSIFIED AD. DEPT. is 5c. per word (minimum of 10 words, including address), 10% discount for 4 consecutive insertions, 15% for 13 consecutive insertions (3 months). Changes will be made in standing classified ads, if copy is received at this office ten days before publication. RADIO WORLD CO., 1493 Broadway, N. Y. C. (Phone, Bryant 4796.)

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WANTED—AGENTS AND REPRESENTATIVES—Get our plan how to make big money selling Radio Sets. NELSON MFG. CO., Interurban Bldg., Dallas, Texas.

BARGAINS—Switch Points, 20c doz.; Binding Posts, 50c doz. Dealers, send for discounts. EARL TOMLINSON, Gibson City, Ill.

FOR SALE—Radio Frequency Transformers. Murad, \$4.75; Radio Corporation, \$5.00; Radio Service, \$4.75. Absolutely new. R. SCHLEGEL, 1118 N. Negley Ave., Pittsburgh, Pa.

TO THE TRADE—Fixed Phone and Grid Condensers. Write for price list and sample. SALKEY RADIO CO., 2378 Eighth Ave., New York City.

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43 PLATE CONDENSERS, \$3.95; Rheostats, 95c; 7-Strand No. 22 Tinned Antenna Wire, 90c per 100 ft.; Manhattan Head Phones, \$6.00; Tested Galena, 20c, mounted, 30c; Contact Points, 30c per dozen; Complete Crystal Sets, with Aerial Equipment and Manhattan Head Phones, \$12.50. Postage paid to second zone. Write for prices on parts not listed. COLUMBIA RADIO COMPANY, P. O. Box 1720, Washington, D. C.

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AUDION RECEIVERS, regular price, \$32.50, reduced to \$25.00 for short time. Wave Length, 200 to 800 meters, Variable Condenser, two Ten Point Switches, Socket, Dials, etc. Mounted on Mahogany Panel in 8 x 9 x 6 Mahogany Finished Cabinet. Shipped prepaid upon receipt of money order. Every set guaranteed. Stamp for descriptive circular. GIBSON & COLLINS, 515 Evergreen Avenue, Brooklyn, N. Y.

PATENTS

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RADIOTRON UV 200 Detector Tube, \$4.50; Radiotron or Cunningham Amplifying Tubes, \$5.85; 90 Ampere hour storage battery, \$14.75; \$5.00 Transformer, \$4.25; 1.25 Socket, 75c.; \$8.00 phones, \$6.75; R-3 Magnavox, \$41.50; \$1.00 Dials, 3"-3 3/4", 65c.; Bakelite or Formica Panels cut to size, 2 1/4c. per square inch; \$1.50 Rheostat, \$1.20; Nickel Binding Posts, 7c.; Taps, 2 1/2c.; Stops, 2 1/2c.; Variometer, Mahogany or Spanish Cedar assembled, \$3.00; Variocouplers, assembled, \$3.00; Bank Wound Inductance, 200-2500 meters, \$8.00; \$3.50 Condensers, 23 plate, \$2.60; \$4.75 Condensers, 43 plate, \$3.70; "B" Battery, 45 volt (variable), \$4.00. EAST WEST RADIO CO., 31 Pleasant St., San Jose, Cal.

A BROADCASTING MAP of the leading broadcasting stations of the country was published on the center page of RADIO WORLD dated May 20. Mailed on receipt of 15c., or send \$3.00 for six months, or \$6.00 for a year, and start your subscription with May 20 issue. RADIO WORLD, 1493 Broadway, New York City.

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Help Your Broadcaster


IF the radio program from each station does not contain selections sung by famous artists, remember that the broadcaster and the entertainer are giving their time, for your amusement, gratis, and that famous artists are hard to get; that fifty-watt tubes cost \$30 apiece, and are difficult to obtain, and that the costs of running a station are heavy at all times, says "Radio Journal." Entertainers sing for the publicity they get out of singing, and the broadcaster sometimes has a difficult time to get anything but phonograph music. If you know anyone who might want to sing over the radio take him or her to your favorite station and effect an introduction. If your friend really can sing there will doubtless be a place on the program. Be constructive, however—don't kick. Aid your broadcaster.

* * *

A Radio Catastrophe

THE Los Angeles "Times" suggests that the difficulty in procuring good audions these days may be due to the fact that the world's supply of vacuum may be exhausted. This is in line with "Life's" brilliant remark that "after careful investigation, the New York police report that the crime wave is caused by ultra-violet rays."—"Radio Journal."

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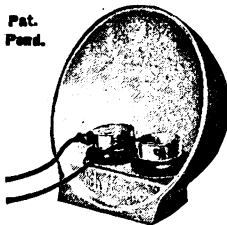
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Advertising rates on request.

Entered as second-class matter, March 22, 1922, at the Post Office at New York, New York, under the act of March 3, 1879.

IMPORTANT NOTICE:

While every possible care is taken to state correctly matters of fact and opinion in technical and general writings covering the radio field, and every line printed is gone over with a scrupulous regard for the facts, the publisher disclaims any responsibility for statements regarding questions of patents, priority of claims, the proper working out of technical problems, or other matters that may be printed in good faith and on information furnished by those supposed to be trustworthy. This statement is made in good faith and to save time and controversy in matters over which the publisher cannot possibly have control.

How the "Time Tick" Is Sent

THE manner in which the time signals are transmitted from Arlington is as follows: The ticks are reproduced, starting from 9.55, Eastern standard time, every evening. Each second is sent out as a short dash, which is reproduced in the telephones. The tick of the twenty-ninth second of every minute is skipped, leaving quite a distinctive space. At the end of each minute the signals are omitted for several seconds, making a longer pause. At the end of the fifty-ninth minute after 9 o'clock the signals are omitted for ten complete seconds, which, of course, is much more noticeable. This longer pause also permits the operator of the broadcasting station to announce over the 360 meter wave his famous: "The next dash will be 10 o'clock."

One of the officials of a broadcasting station made the following suggestion:

"A convenient way to check your watch is to follow the second hand during the first part of the signals, thus noting the position of the second hand relative to the end of the minute. The minute hand should be observed during the fifty-ninth minute and checked with the signal for 10 o'clock. In this way you can tell exactly how many minutes and seconds your watch needs to be changed in order to have absolutely correct time."

Defining "Ground"

EDITOR, RADIO WORLD: Looking over your "RADIO WORLD'S Revised Radio Dictionary," by Fred. Chas. Ehlert, I note in the definition of "Ground." It states that "Its main function is with the antenna, or aerial, and acts as a large condenser between the aerial and ground."

While this, in a way, is correct, permit me to suggest this definition:

The aerial and ground comprise a huge condenser with the air between as the insulator or dielectric.

From your definition, one not familiar with radio might get the erroneous idea that the air between the aerial and ground is the condenser while, in truth, it is the dielectric.—H. V. Houyoux, Franklin, N. J.

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Dr. Miller, of Chicago, writes: "My perfectly good variometers and vario-coupler now go into the discard."

Public Health Broadcasts Resumed

THE Public Health Information Service by radio, the only national education by radio in the world, is again back on the air through NOF, the Naval Radio station at Anacostia, D. C. This service, together with all voice broadcasting through naval stations, was temporarily suspended on April 15, in order to effect a reduction in the existing interference pending decision on a government radiotelephone policy. The development of a radio policy has progressed to a point where it is possible for the Public Health Service broadcasts to be resumed. Since this educational service was suspended, hundreds of letters have been received from operators all over the eastern half of the United States asking that the public health broadcasts be continued.

"While we regret the temporary suspension of this service since April 16," an official of the Public Health Service said to-day, "we realized the necessity for a government radio-policy and appreciated fully the wisdom of suspending service until a government policy could be established and a program for avoiding interference devised. The letters received indicate that the broadcasting of educational material for the consumption of the general public has met with popular approval."

With the resumption of broadcasting public health-messages through NOF, the station through which the Public Health Information originally began, stations co-operating with the Public Health Service in spreading the "gospel of health" will number seven, including WGI, American Radio and Research Corporation station nat Medford Hillside, Mass.; CKAC, "La Presse," Montreal, Canada, releasing in both French and English; KDKA, Westinghouse Electric & Manufacturing Co., East Pittsburgh; WRK, Doron Brothers Electrical Co., Hamilton, Ohio; 7XF, Northwestern Radio Corporation, Portland, Oregon; and KFC, "Post Intelligencer," Seattle, Washington.

These Public Health broadcasts are being released through NOF on Tuesdays and Thursdays at 7:45 p. m., standard time.

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Notified By Radio, He Meets Steamer By Airplane

A HUNDRED years ago, if anyone had even suggested that such a happening—as that described herewith—would ever take place, he would have been hung for witchcraft. Twenty-five years ago, such a prophet would have

been dubbed a "poor, misguided boob." To-day, we simply shrug our shoulders and remark, "Zat so."

C. Holmes Rapp, a business man of Chautauqua, New York, was sitting in his room at Atlantic City, when he re-

ceived a radio message from his wife on board the French liner "La Savoie" at Ambrose Lightship, twenty-five miles from New York City, that the vessel would dock that same night. Mr. Rapp found that the last train by which he could reach the New York pier in time to greet his wife had left Atlantic City. The only way the journey could be made was by airplane.

Mr. Rapp succeeded in chartering a flying boat, and made the trip, comfortably, in seventy-five minutes. He landed at the foot of Eighty-sixth Street, North River, at 9 o'clock, and went to the French Line pier at the foot of West Fifteenth Street by taxicab, arriving in ample time to welcome Mrs. Rapp at 10:50 P. M.

He said the trip by air was far more comfortable than the usual journey by train. Daylight lasted until the plane neared New York, when a slight mist was encountered.

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Radio Spelling Bee Needed!

HAVING read hundreds of letters written to "The Evening Mail Review" by amateurs seeking advice, the young man in charge of the laboratory took a day off and compiled the appended list of mis-spelled names contained in the letters. He explained each name in the spirit induced, apparently, by the spelling:

- Ariel—Wave grabber.
- Lose Cuppel—Method for connecting wave-trains.
- Grownder—Same as water pipe.
- Gleaner—A crystal which collects sounds, and dust.
- Varibel condensor—Plates to hold waves temporarily.
- Swich—Device for trying another set.
- Indoor ariel—Bedspring.
- Roter—Opposite of Stater.
- Arestor—Scheme for leaking lightning away.
- Transformser—Device for changing squeak into howl.
- Howel—Result of Armstrong's discovery.
- Lisense—Scrap of paper issued by Radio Inspector.
- Loding coil—Portable antenna lengthener.
- Honeycome coil—Coil of wire with college education.
- Button—Same as switch point.
- Sodder—Glue for copper wire.
- Reostat—Arrangement to light tubes on six volts.
- Panle—Piece of soap box.
- Multy-Circit jack—Scheme for complicating diagrams.
- Milkrofarrad—Contents of a condenser.
- Hell—Winding the inside of a variometer.
- Raddio Editor—Only person who knows Armstrong's new circuit.
- Dector—Complete gleaner outfit, including cat whisker tickler.

Big Radio Cable Service Planned

IMPORTANT news comes from Australia to the effect that the six States of Australia, combined with Canada and Great Britain will supplement the "All Red" cable line with a highly developed radio service.

The main Australian station will probably be located in New South Wales. According to the Melbourne "Argus," the power used will be about 3,000 kilowatts and the combined cost of the central station and of a feeder station in each of the six Australian States will be \$5,000,000. The plant for the central station will be manufactured in England, but those for the smaller stations will be made in Australia.

The controlling interest in the Amalgamated Wireless is vested in the Commonwealth Government, and of the seven directors the government and the minority stockholders will each have three, the seventh being chosen by vote of the first six. An important clause is that prohibiting the Amalgamated Wireless from combining with any other commercial interest and requiring it to remain always "an independent British concern."

The company is also to develop, manufacture and sell radio apparatus and to furnish service to ships and aircraft. It has been made a party to the general agreement for the interchange of radio patents entered into by the principal radio equipment companies of the world.

New high-power radio stations to communicate with Australia are planned for Great Britain and Canada. The proposed rates for services are about two-thirds of the present cable rates.

Radio-Detector Minerals Now in Use

THERE are a number of minerals used as radio detectors and each crystal has some individual characteristic which must be treated in various ways to make it satisfactory for radio work, says a writer in "The Times," New York. The most widely used of all crystals is galena and carborundum. Perikon, silicon, tellurium, molybdenite, zincite, iron pyrite and several other minerals also allow unilateral conductivity. The crystals are generally held firmly in a small metallic cup, clamping device or molded in a bed of easily fusible metal such as Wood's metal. The crystals are either placed under a heavy or light pressure, depending upon the type of mineral employed, or a metallic contact is made by a fine wire resting lightly on the surface of the crystal.

Galena, the most sensitive of crystal detectors, is sulphide of lead mined in several of the Western States. It has

a brilliant metallic luster and a bluish-gray or lead-gray color. The galena detector consists of a small piece of the mineral held in a metallic cup or clamp so an electrical connection is made possible. A fine wire of copper, about size No. 32, rests on the surface of the crystal. The great disadvantage of such a detector is lack of stability or permanent adjustment, since the wire is easily jarred off the sensitive spot best suited for its work.

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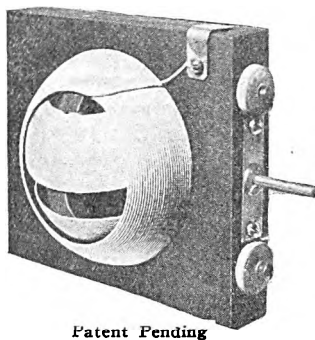
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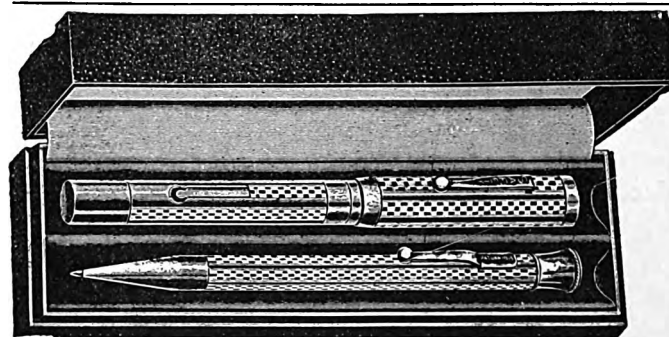
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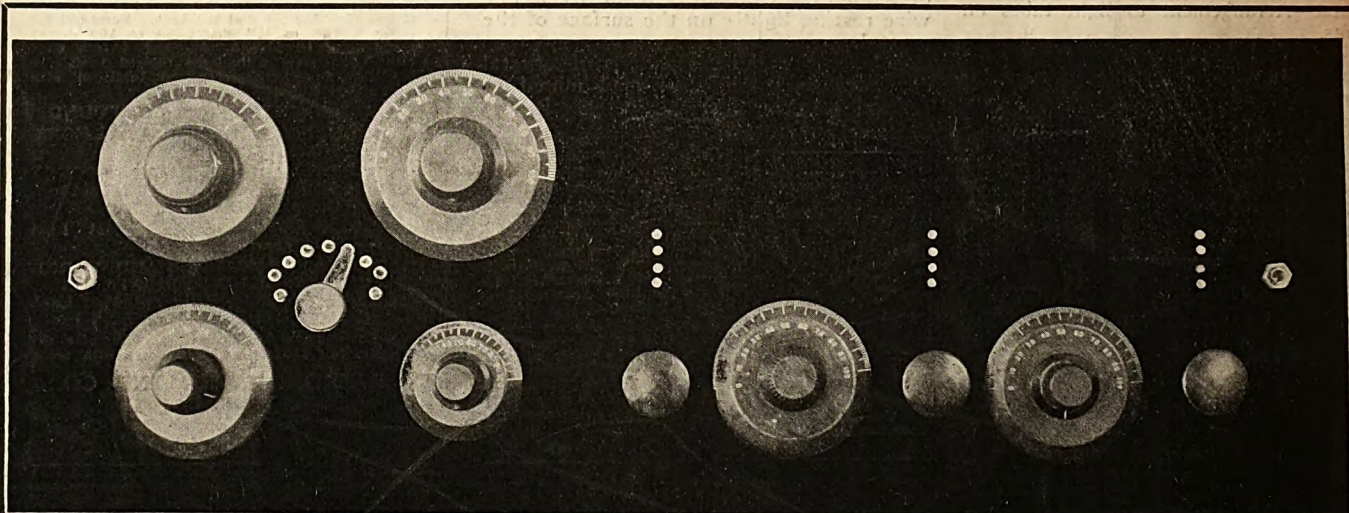
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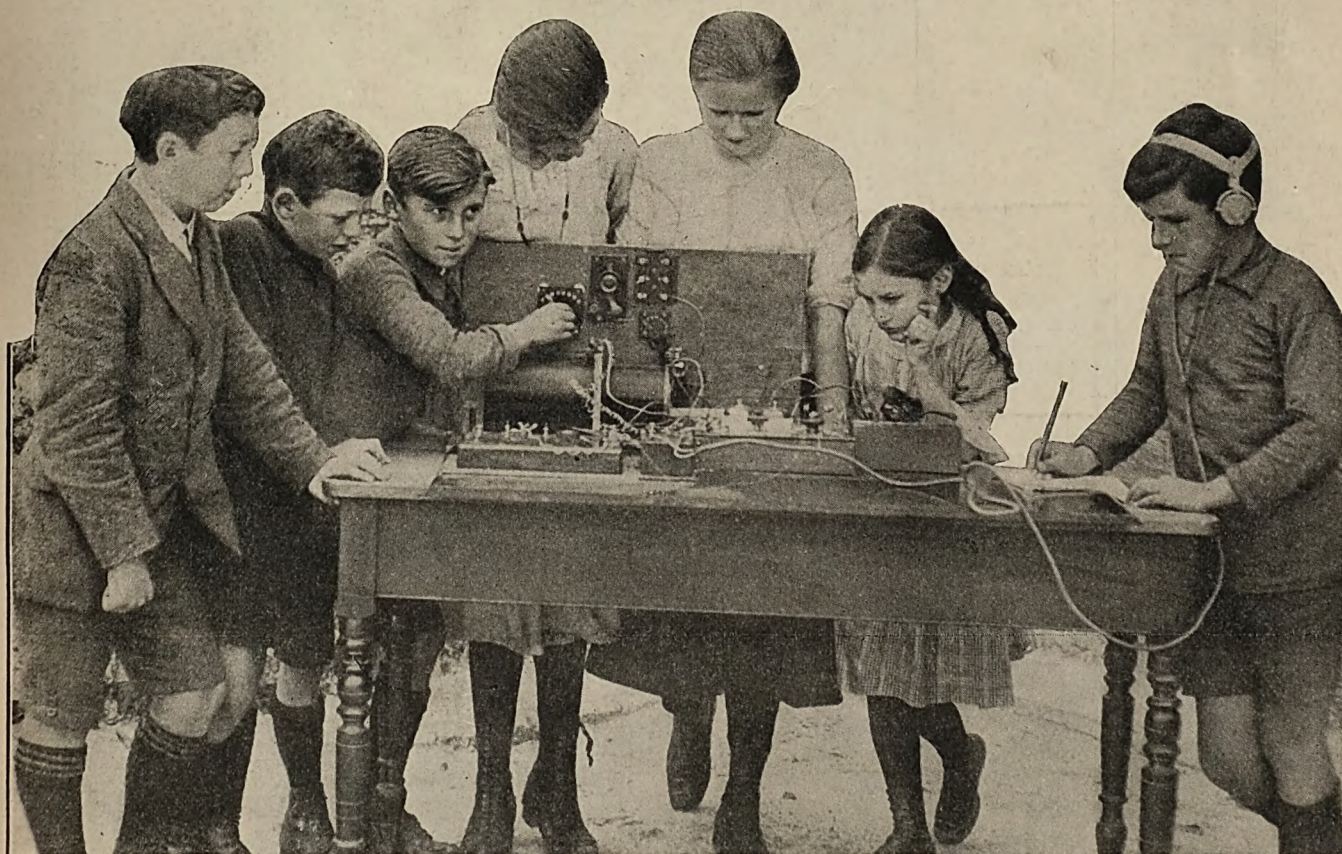
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RADIO WORLD

Entered as second-class matter, March 28, 1922, at the post office at New York, New York, under the act of March 3, 1879

I L L U S T R A T E D

Do School Children Take to Radio? Look at 'Em!



(C. Central News)

Radio receiving-set in the school at Foxhole, Cornwall, England. It is the first to be licensed and set up in a British primary-grade school. The apparatus was designed, partly made, and wholly assembled by two of the older boys. Clear spark-signals are received from ships at sea, and C-W on the longer wave-lengths. The boys and girls regret only one thing, it is reported; they are too young to be "night owls."

How to Build a Spider-Web Receiver

See
Page 4

RADIO WORLD

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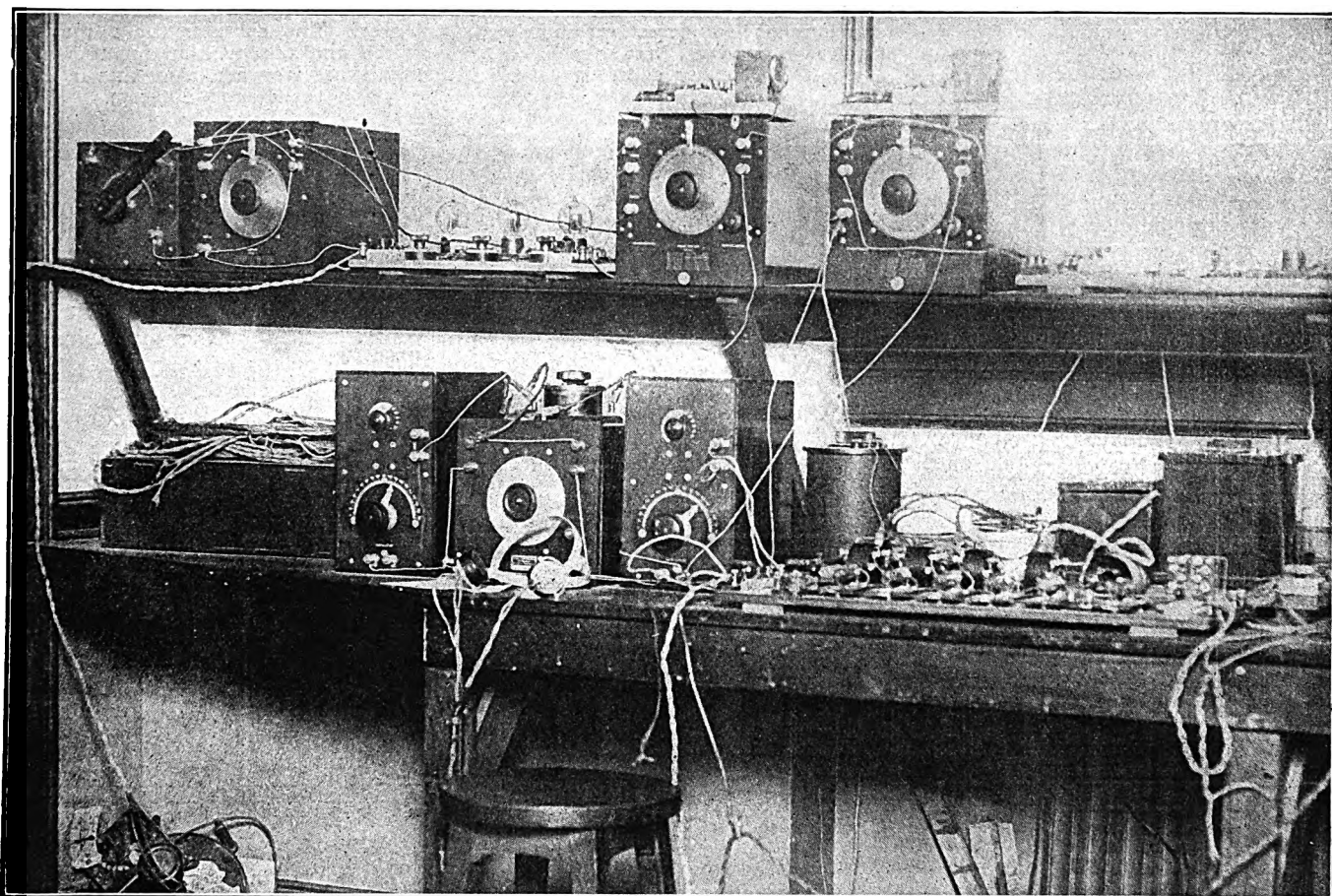
A Weekly Journal, Published Every Wednesday and Dated Saturday, By Radio World Company, from Publication Office, 1493 Broadway, New York, N. Y. Telephone: Bryant 4796

Vol. 1, No. 22

August 26, 1922

15c. per copy, \$6.00 a year

Radio Message Sent from Europe Received by This Set in New York



(C. Central News Photo Service.)

Six tuned circuits and twelve vacuum-tube amplifiers are required to give the transoceanic signals the necessary strength so that the ink recorder (on the flat elevation at the right) may make a permanent record of the signals, enabling the message to be read. It is a fine type of the powerful radio receiver.

Radio Exports, \$1,164,514 for Six Months

AMERICAN radio apparatus is beginning to be exported in considerable bulk. In June shipments amounted to over half a million dollars, which is the greatest value of radio exports for several months. Experts of the Electrical Division of the Department of Commerce say that radio is only a part of recent gains in electrical exportations which, for June, were \$2,000,000 greater than in May. This is regarded as indicative of our recovery of the export trade of the United States in electrical supplies and equipment.

Our total export values for radio equipment during the past six months, amounted to \$1,164,514, June being the best month with exports valued at \$547,364 and totaling nearly a million pounds of goods. The

value for June was almost three times the exports of radio equipment for May. A sort of boom in the shipment of American radio goods to foreign countries started in February, which month saw the exportation of \$283,950 worth. There was a slump in March, during which only \$21,180 worth was shipped out, but in April the figures rose to \$116,221, while for May they increased to \$186,364.

The fluctuation is said by experts to result from occasional big orders which are completed during certain months and shipped out, the orders keeping to a more regular curve. In February, for example, the bulk of the shipments went to Poland and Danzig, where big radio stations were being built, boosting the export figures by \$258,094.

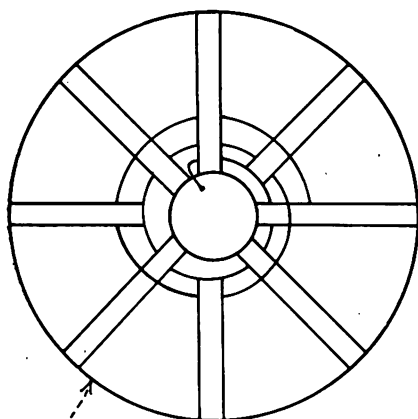
The only other shipments of any size were to the British West Indies and the Philippines, which totaled, jointly, only about \$20,000. Britain, Panama, and Japan took most of the radio apparatus in March. In April, Poland and Danzig got \$12,790 worth, while Quebec, Ontario, Mexico, and Cuba imported about seven times that value. During May, Ontario received \$118,836 worth of radio goods, Mexico \$14,044, and England \$13,444.

Denmark has evidently caught the prevailing radio epidemic, as reflected in requests for American wireless-telephone apparatus, listed in trade opportunities filed with the Department of Commerce. Australia and Italy also have buyers seeking American electrical equipment.

TTFA
+

How to Build a Spider-Web Receiver

By Frederick J. Rumford, A. M. A. I. E. E.



5" Diameter of either 9, 11, 13, 15 or 17 slots, always of an uneven number

Fig 1

Showing how the wire should be wound into the slots.

A SIMPLE and efficient, also inexpensive, receiving-set I will describe in this article. It is commonly known as the spider-web receiver. It will take the place of the loose coupler, the vario-coupler and the variometer. It may be used also as an inexpensive regenerative receiver. These spider-web coils may be made up for experimental and amateur purposes and uses; but under no circumstances may they be made up for commercial purposes. I am not giving any definite data, as I think it will be better for the person who is thinking of building this spider-web coil to experiment, as he will then arrive at a hook-up, or a coil with a definite number of turns, which will suit his own particular wants better than any which I could describe.

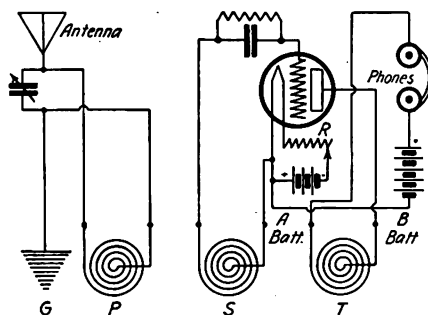
Figure 1 shows the method of winding the wire into the slots.

Figure 2 shows the hook-up for a three-circuit receiver with a vacuum tube for detection; namely, the primary, secondary, and the plate or tickler coils.

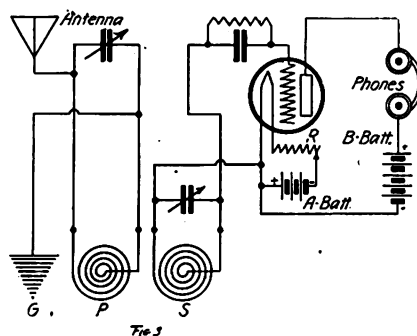
Figure 3 shows a hook-up for a two-circuit receiver with a vacuum tube for detection with primary and secondary coils.

Figure 4 shows the hook-up using a crystal detector for detection in conjunction with a phone condenser.

First, the builder must decide whether or not he wants a one-, two- or three-circuit receiver. For a single-circuit receiver, he must purchase a piece of heavy cardboard $5\frac{1}{2}$ inches in diameter and give it several good coats of shellac. Put in a warm oven and bake it in order to avoid any possible chance for further shrinkage. A center must be left of about $1\frac{3}{4}$

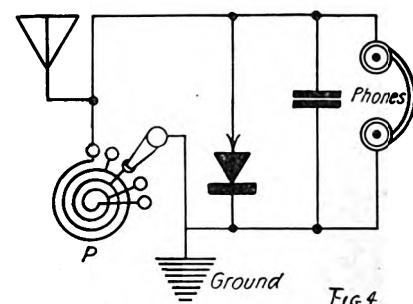


Hook-up for a two-circuit receiver with a vacuum tube for detection; namely, the primary, secondary, and the plate or tickler coils.



Hook-up for a two-circuit receiver with a vacuum tube for detection with primary and second coils.

inches in diameter. He should then wind this coil with about 60 to 75 turns of either 22-inch, 24-inch, or 26-inch silk-covered wire, taking a tap about every 15 turns. The contacts of a multipoint switch and the hook-up



Hook-up using a crystal detector for detection in conjunction with a phone condenser. The contacts for a multipoint switch and the hook-up for this single-circuit receiver are also shown in this schematic diagram.

for this single-circuit receiver are shown in Figure 4.

If the builder wishes to construct a two-circuit receiver, he should follow exactly the directions for the single-circuit receiver with the exception of having the secondary coil wound with a smaller-size wire than that used on the primary.

If a three-circuit, or regenerative, receiver is desired, the primary should be wound with about 75 turns of No. 24 silk-covered magnet wire, and the second wound with about 75 turns of No. 26 silk-covered magnet wire. As for the tickler, it may be wound with about 50 to 60 turns of either of the above sizes of wire or of a smaller size wire, but silk covered magnet wire it must be. The centers of these three coils should have a small hole drilled in each of them so that the mounting shaft can be readily fastened to them. This mounting shaft should be about 8 inches long and so arranged that the coils may be moved in close relation to one another. The number of sections should be either 7, 9, 11, 13, 15, or 17 sections—always an uneven number.

The method of section wiring is shown in Figure 1. Bring the wire over one section and under the other section; over the next section and under the next section; and so on until the coil is wound with the desired number of turns. It is advisable to have at least $\frac{1}{4}$ -inch space between each section.

This is what I mean by sections. After securing the piece of cardboard, divide it into whatever numbers of sections you wish, unevenly. This should be done with a pair of dividers and then slit with a sharp penknife.

It would pay an amateur to make up several sizes of spider-web inductance as they are inexpensive. It would be a good plan to get some of the 10-cent records. They would make perfect coil-forms and would be of considerable insulation strength.

Nightly Heir Schedule: "Tuning Up"

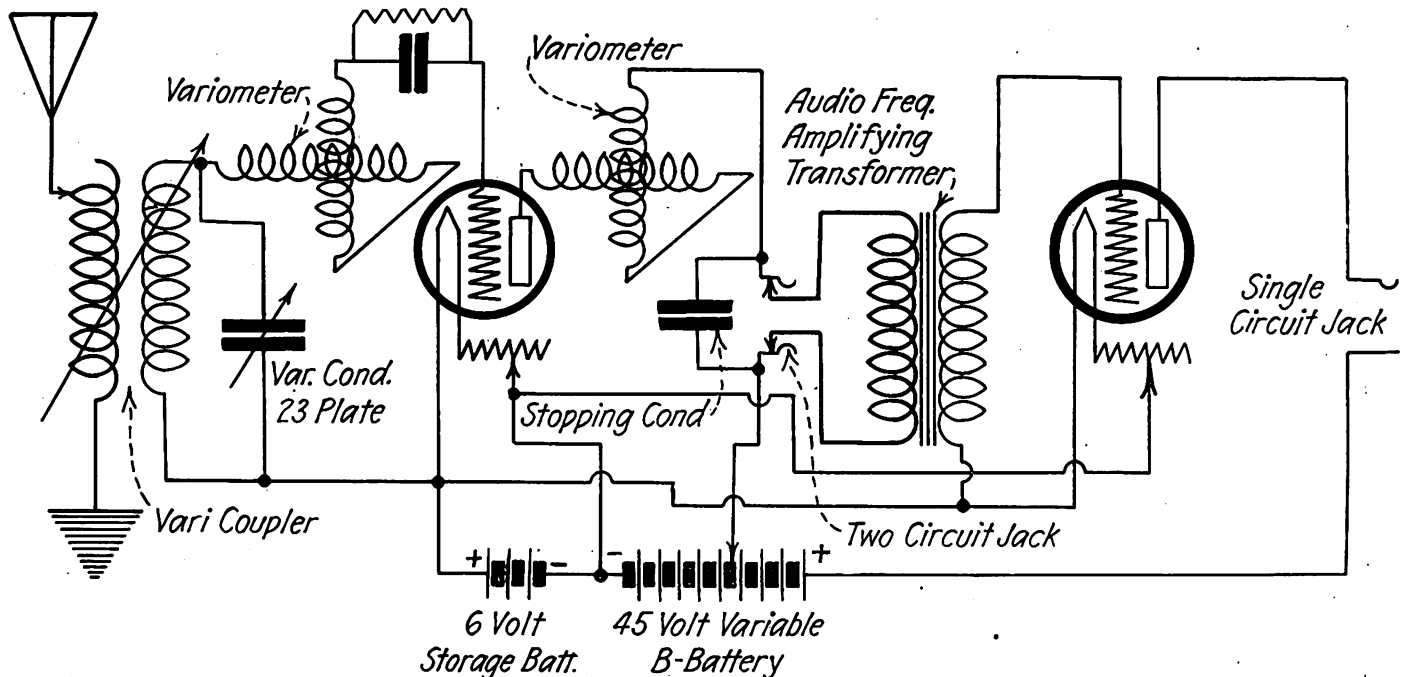


(From "Judge")

The day may not be far distant when a power line will be operated by radio.—Charles P. Steinmetz.

My Detector and One-Step Amplifier

By Fred. Chas. Ehlert



Schematic diagram of a regenerative set employing a detector and one-stage amplifier of the vacuum-tube type. Jacks are used exclusively in this circuit, enabling the operator to use a detector or amplifier. Suggested by Fred. Chas. Ehlert. Drawn by S. Newman & Co.

SO much interest has been shown by amateurs who have familiarized themselves with tube operation in receiving sets, that they are anxious to go ahead another peg and add another step of amplification. Irrespective of the circuit employed, this stage of audio-frequency amplification may be added. If by chance the receiver should happen to be of the regenerative type, most astounding results should be obtained.

The apparatus needed should be carefully looked over. It should consist of the following material:

- 1 audio-frequency transformer.
- 1 tube socket.
- 1 amplifying vacuum-tube.
- 1 45-volt B variable-battery.

Generally, the audio-frequency transformer has four connections. They are marked P, meaning primary; S, meaning secondary; F, meaning filament minus; FX, meaning filament plus.

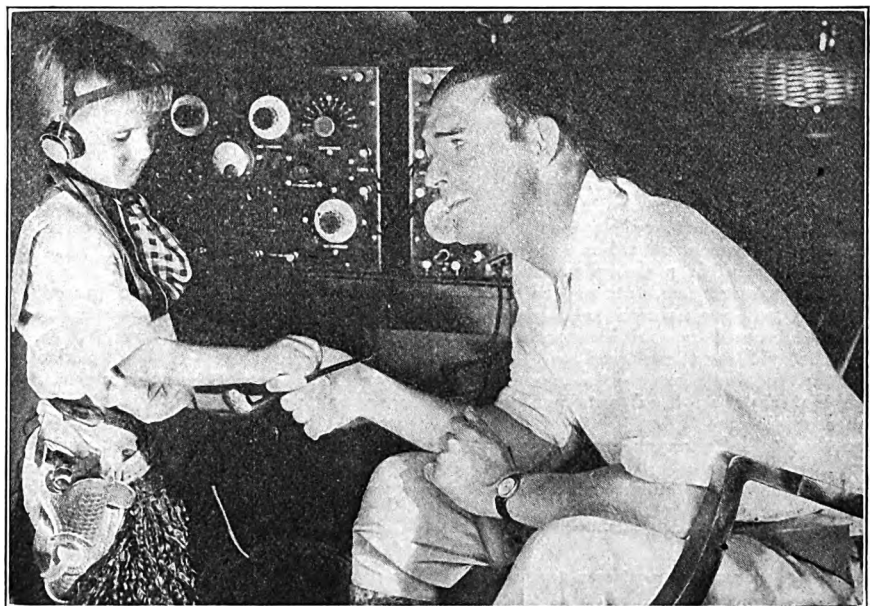
Other transformers, at times, are marked somewhat different, and if a few rules are observed, no trouble should arise. These transformers are marked Grid, Plate, Filament minus, and Filament plus. When they are marked this way, the Grid pertains to secondary; Plate pertains to Primary; and, of course, the Filaments are the same as in other transformers.

Always make the wiring so that when two wires run, or seem to run, in parallel try to have them cross each other, or at right angles to each other. This will help the set considerably.

Care should be taken to see that all connections are correct and always soldered. The second tube is an amplifying tube. A detector tube should never be inserted, as poor results will be obtained. This will discourage the builder and probably convert him back to his old single-tube set. The plate of the second, or amplifying, tube should have, approximately, 45 volts;

but the detector tube should have only from 18 to 22 volts, according to the tubes used in the circuit. With the proper voltages used in the plate and filament circuit—remembering that the plates of both tubes need different voltages, and placing the phones according to the accompanying sketch—signal strength should be increased immensely.

Wallace Reid as a Radio Instructor

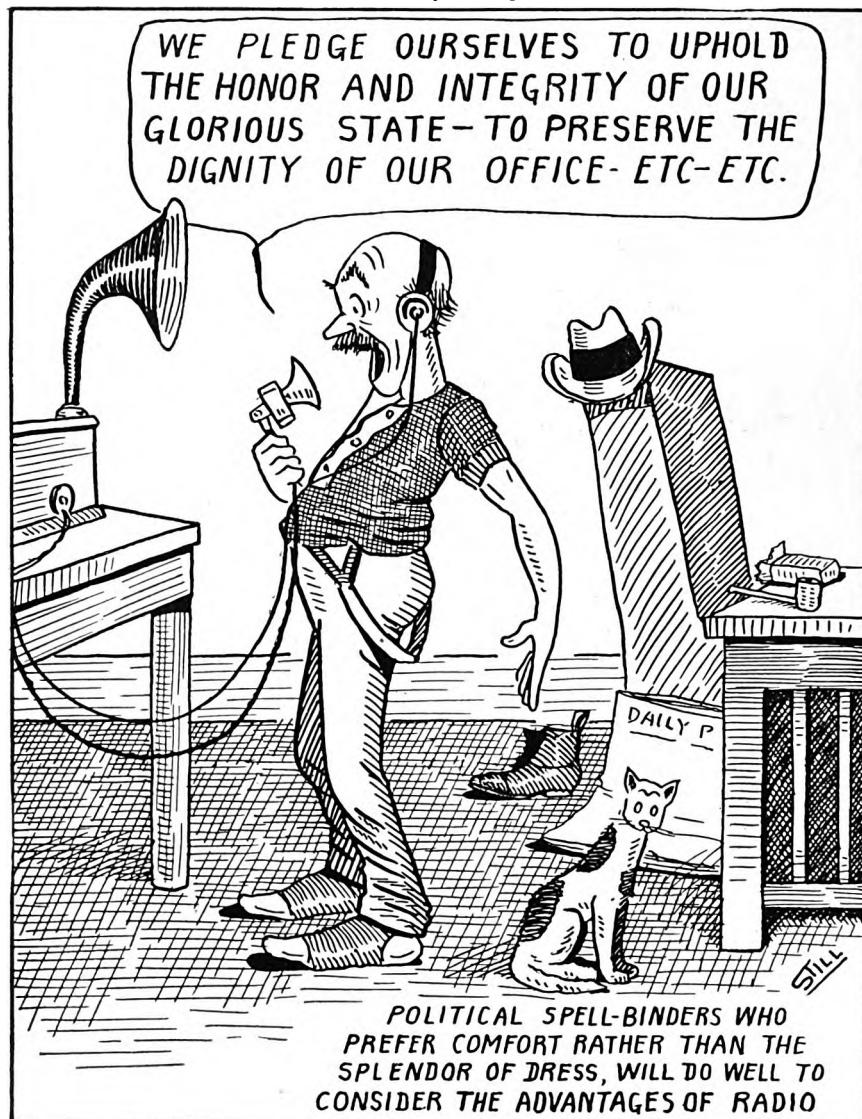


(C. Kadel & Herbert, N. Y.)

Wallace Reid, known to thousands of "movie" fans, is very much of a radio fan in private life. To keep his little son amused, he installed a radio set in his home at Hollywood, California, and is explaining "how it works."

Radio Doesn't Care Just How You Dress to Make a Speech

Original cartoon by Harry R. Stillman.



Hints for Fans

By C. F. Rye

WHEN fastening my variocoupler and variometers to my panel I used glue so as not to mark the face of my panel with screws. After having things set, I noticed, one rainy day, that the glue was soft again. After drying the joint and shellacking I had no further trouble. The shellac keeps out the moisture.

I have a crystal—like most amateurs within range of a close station—but could not devise any way to be notified when a lecture or a concert started. While experimenting I tried the following, and it worked well. I tuned the set for the 360 wave-length and hung one of my receivers up near the canary's cage. Now, as soon as the phones start, the bird will start also and sing at the top of his voice continually until we remove the receivers. For a crystal set, this is the best alarm of which I know.

* * *

When static was bad I tried several ways to cut it out. The following helped: I disconnected my aerial, connected my set to the heating system, and used a six-foot pipe in the ground for the ground connection. I was surprised to get satisfactory results—much better than I often secured in rainy weather. These two simple connections will be of great advantage to a fellow whose landlord will not permit him to string an aerial on the roof. Our heating system is in a large building, and acts as a splendid aerial. I do not know why it should, because it was connected with the water and heating system. The water pipe did not serve as a ground in this hook-up.

Radio Musts

SEE that your set is kept clean.
 See that storage battery is charged.
 See that your aerial is not grounded.
 See that storage battery is not dead.
 See that all contacts are free from dirt.
 See that plates in battery are covered with water.
 See that the B battery is placed in the proper circuit.
 See that filaments of tubes are not burning too brightly.
 See that aerial is making good contact on receiving set.
 See that proper connections are made when using jacks.
 See that you are using a good ground connection on receiver.
 See that secondary variable condenser is of the right capacity.
 See the grid condenser and grid leak are of the correct value.
 See that variometers are in correct circuit for regeneration.
 See that caps on head sets are not too loose or too tight when receiving.
 See that telephones are making good contact when using a plug.
 See that taps on vario-coupler are properly secured and soldered.
 See that the correct polarities of the batteries are used in circuit.
 See that proper connections are made on detector tube and B battery.

Radio Don'ts

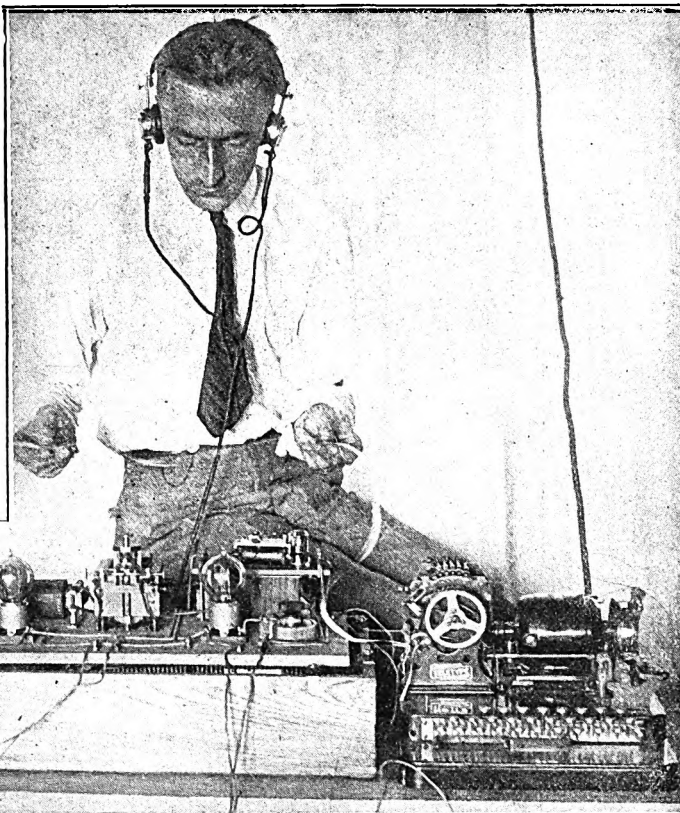
DON'T turn rheostats too high.
 Don't allow battery to get low.
 Don't have any loose connections about aeriels.
 Don't work behind panel with a long-nosed screw driver.
 Don't allow the vacuum tubes to burn while making a repair.
 Don't leave your switch on aerial when closing up the station.
 Don't have your aerial too short. One wire 100 feet long is best.
 Don't use a soldering iron when making necessary repairs in rear of panel.
 Don't try to hear the short-wave stations when using a loading coil.
 Don't add a loud-speaker to a plain crystal receiver and expect results.
 Don't use dry cells for filament lighting. They are an expensive proposition used in this connection.
 Don't connect too many phones as they will decrease the signal strength considerably.
 Don't leave your switch on aerial when shutting down for the night. Always have it on ground.
 Don't use too much plate-current on the detector tube. Usually 18 volts will act satisfactorily on detector.
 Don't run your aerial too close to electric light wires. Have your aeriels at right angles to such power lines.

Amplification in Radio Frequency, by H. S. Potter, with Schematic Diagrams. In Radio World, No. 23. Next Week!

Typewriting on Airplane Received on Land by Radio

Machine's Keys Give Wireless Impulse and Are Easily Reproduced.

By W. R. Service



(C. "P. & A. Photos")

The operator in the United States Navy Yard, Washington, D. C., "reading" the messages on the receiving set, sent by radio from an airplane.

THE Bureau of Standards, Washington, D. C., recently explained some experiments by F. W. Dunmore, which indicated that a recently perfected radio-relay recorder might do away with code operators by printing the code message on a tape so that it could be read visibly by inexperienced men, but now the Naval Aerial and radio experts have gone the bureau one better—they print radio messages automatically on a typewriter.

Co-operating with the Radio Laboratory of the bureau, experts of the U. S. Navy, successfully tested the operation of the line—wire teletype by radio a few months ago, and succeeded in printing messages from a distance of nine miles. The radio circuit was established between the Bureau of Standards, near Chevy Chase, and the Naval Air Station at Anacostia.

More recent experiments have established the fact that teletype messages printed on a machine installed in an airplane and transmitted by radio may be recorded on a typewriter in a ground station. Future experiments will undertake the reversal of this operation; the sending machine being on the ground and the receiving apparatus installed in a plane in flight. Great interest is manifest by Naval experts as the new method will permit the sending and receipt of duplicate orders of record, eliminating errors and a knowledge of code, besides saving time of rewriting.

The practical tests made assure future commercial uses in aerial news re-

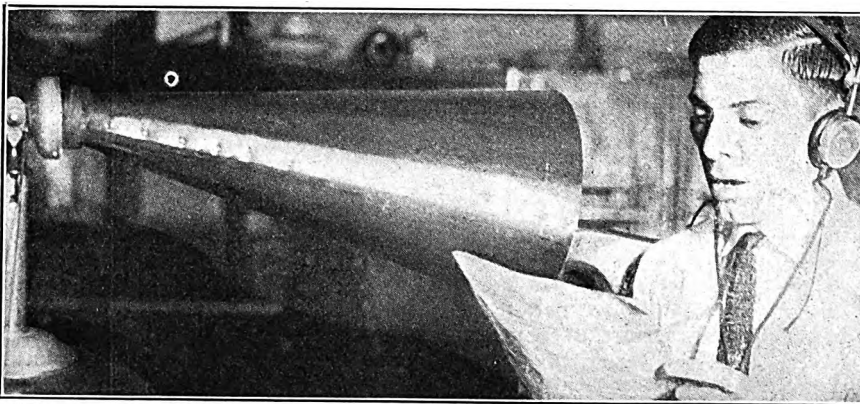
porting, when a correspondent covering an aquatic event, marine engagement or sea maneuvers can send his copy straight to the desk. Another value, if aerial passenger lines are extended, would be the receipt and dispatch of typewritten telegrams, stock reports, news dispatches, etc., ready for delivery.

The sending instrument of the teletype resembles in general the commercial typewriter, in that a keyboard having the alphabet and other conventional symbols is so arranged that it may be operated by hand. Each key is connected to the radio installation in the plane and when a letter is struck on the

keyboard a radio impulse is sent out from the antennae of the plane and is received at a ground station. The similarity to the typewriter is completed in the receiving device. When the letter A is struck on the keyboard in the air, a radioactive energy released travels to the recording instrument and selectively energizes the type-letter A, causing it to be reproduced on paper carried in the receiver.

The teletype has been in use for eight years in connection with land-wire operations, but its application to radio use is a recent development. The tests at the Naval Air Station are the first conducted in an aircraft.

After Motor Thieves by Radio



(C. Underwood & Underwood, N. Y.)

Motorcar thieves—most prolific of the many marauders now operating in the United States—have radio on their trail. They "worked" Washington, D. C., to such an extent that Inspector Grant, of the District of Columbia Police, ordered that news of such thefts be broadcast throughout the country. The photograph shows Anthony Ciaverella connected with the department's radio room, transmitting the report of a theft.

Condensed History of Radio from the "Edison Effect" to Marconi's Directional Waves

By C. D. Wagoner

1883. Thomas A. Edison discovered what is now called the "Edison Effect," a phenomenon occurring in a burning incandescent electric bulb, in that an electric current can be made to pass through space from the burning filament to an adjacent cold metallic plate. While not applied to radio at this early date, the discovery was later used in developing the vacuum tube, now a veritable modern Aladdin's Lamp and the very heart of radio communication.
1885. Electric signalling through the air without connecting wires begins when an English experimenter stretches two lengths of wire, one-quarter of a mile apart, and by charging one with a local electric current is able to induce a response in the distant wire.
1887. Professor Heinrich Hertz, a German scientist, proves experimentally that electric waves are sent through space with the speed of light by the electric discharge that takes place when a spark is made by an induction coil or a static machine. These waves have since been called "Hertzian Waves."
1890. Professor E. Branly, of Paris, develops the coherer which considerably improves reception.
1894. British experimenters bridge a distance of $1\frac{1}{4}$ miles by means of improvements on the original induction system of 1885.
1895. Guglielmo Marconi proves that electric waves can be transmitted through the earth, air, or water by means of sparks producing high-frequency electrical oscillations.
1896. Marconi further proves that telegraph signals can be sent and received by means of Hertzian waves up to a distance of three miles.
1900. A. F. Collins bridges distance up to eight miles by means of his so-called electro-static system of wireless signaling.
1901. Marconi, spurred by his early success, finally succeeds in bridging the Atlantic Ocean from Poldhu, Cornwall, England, to St. Johns, New Foundland, by sending the historical series of the letter "S," the distance being 1,800 miles.
1902. Professor E. Ruhmer's photophone system of wireless covers a distance of 20 miles at Kiel, Germany.
1902. Wireless telegraphy is adopted on large transatlantic passenger vessels, the test being on the American steamer "Philadelphia."
1902. Professor J. A. Fleming, of London, England, invents the two-element thermionic valves-detector for radio reception.
1906. Professor R. A. Fessenden, an American experimenter, develops a high-frequency alternator system, having a range of 20 miles.
1906. The Telefunken Arc system of wireless telegraphy is developed and covers a distance of 25 miles.
1906. Dr. Lee De Forest, an American radio expert, improves the Fleming original vacuum tube by inserting the third or control element, known as the grid.
1908. Professor Poulsen perfects another arc-transmitting system which covers more than 150 miles on first test.
1908. Marconi transatlantic radio stations are opened to the general public for the transmission and reception of radiograms between Great Britain and Canada.
1908. Professor Marjorana perfects an arc oscillating-generator and liquid microphone-system, and bridges Rome with Sicily, a distance of 300 miles.
1911. The radiotelephone covers a range of 350 miles between Nauen, Germany, and Vienna, Austria.
1912. The International Radio Telegraphic Conference approves regulations to secure uniformity of practice in radio services.
1912. E. H. Armstrong, an American, invents the now famous regenerative vacuum-tube circuit while experimenting at Columbia University.
1913. The powerful radio station at Nauen, Germany, successfully bridges a practical telegraphing distance of 1,550 miles.
1914. Laws are formulated by foremost maritime nations requiring vessels of certain sizes and grades to carry wireless equipment and operators.
1914. The Marconi Wireless Telegraph Company of America inaugurates a new American transoceanic wireless service by opening its California-Honolulu circuit.
1915. The American Telephone and Telegraph Company, working in conjunction with the Western Electric Company, succeeds in telephoning by radio from Washington to Paris, a distance of 3,700 miles, and from Washington to Hawaii, a distance of 5,000 miles.
1916. President Wilson and the Mikado of Japan exchange radiograms at opening of newly established transpacific radio service between the United States and Japan.
1917. Dr. E. F. W. Alexanderson, consulting engineer of the General Electric Company, develops a 200-kilowatt high-frequency alternator now used almost exclusively in transoceanic radio communication.
1918. Both radiotelegraph and radiotelephone conclusively prove their tremendous importance in warfare in the World War.
1919. Canada and England are linked by radiotelephone for the first time, vacuum-tube transmitters being used.
1919. The Radio Corporation of America is formed, taking over the interests of the Marconi Wireless Telegraph Company of America and the radio activities of the General Electric Company in plans for a world-wide wireless system.
1920. The United States Government returns high-power radio stations, employed throughout the war, to the Radio Corporation of America.
1920. American radio amateurs reorganize their forces, now reinforced many thousands of times by war-trained radio men, and begin to turn their attention to amateur radio telephone development.
1920. An American built and controlled station, to be known as Radio Central, is planned with facilities for simultaneous wireless telegraph communication to the entire world. To this end, a tract of land covering ten square miles is acquired on the northeastern end of Long Island, near Port Jefferson, and construction work begins.
1921. Popular radio-broadcasting begins.
1921. Twenty-seven amateur radiomen make history by transmitting across the Atlantic from the United States to Andressan, Scotland. The power used in the various stations averaged from 50 to 1,000 watts.
1921. President Harding formally opens Radio Central by sending a radiogram addressed to the nations of the civilized globe.
1922. Major E. H. Armstrong announces his superregenerative vacuum-tube circuit.
1922. Dr. Irving Langmuir, of the General Electric Company, announces a 20-kilowatt vacuum tube, the most powerful ever made.
1922. Marconi demonstrates to an American audience his radio searchlight, a means of directing radio waves.

"The radiotelephone will be an important factor in preserving the unity of nations and empires and strengthening the bonds between men and their governments."—Alfred N. Goldsmith.

Radiograms

Latest Important News of Radio Garnered from the World Over, and Reduced to Short Wave-Lengths for the Busy Reader.

THE advent of a great New York symphony orchestra into the rapidly developing field of radio was marked, last week when the concert rendered at the Stadium of the College of the City of New York, was broadcast. The Philharmonic, Meliam Van Hoogstraten directing, sent its music by air waves as far as they would carry—perhaps over 2,000 miles.

Yale is arranging to broadcast reports of its athletic events, play by play. The publicity department of the University believed that such items would not only be of interest to a great many people, but would have great publicity value.

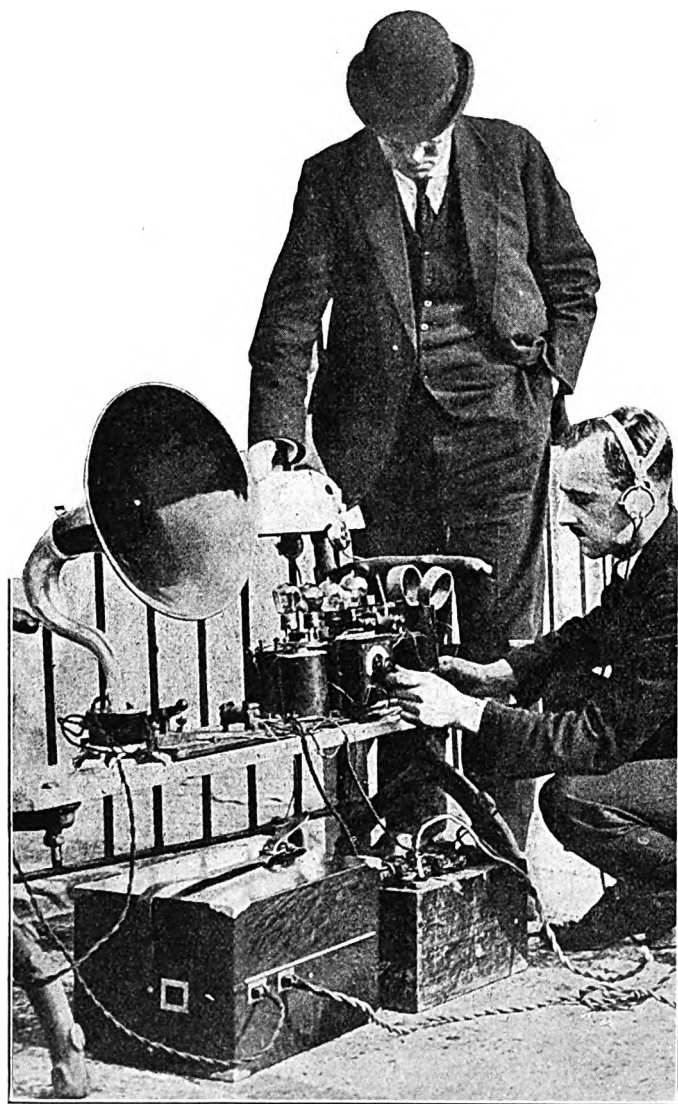
Radio had another big chance to prove its worth when the "Adriatic" encountered disaster in the Atlantic. Twenty-five years ago the passengers would have had to depend upon a few skyrocketing and exploding shells to call aid. Now the silent call of radio blankets the entire ocean in less than a second. Hundreds of stations heard the "Adriatic's" emergency signals, and numerous vessels "stood by" ready to rush full speed to her

assistance. What a comforting sight the aerial between the masts of the "Adriatic" must have been to those on board!

Although radio has met more obstacles in establishing radio-phone service on moving trains than it has on ships, it is safe to say that the day will come before long when a person can successfully talk from a Chicago express train to his home in any city of the United States or to a friend on a vessel far out in the Atlantic.

One of the excellent features of radio not possessed by either the telegraph, telephone or cable is the great speed of 186,000 miles a second, a velocity which carries a radio message around the world seven and one-half times in a second, in less time than a telephone receiver can be lifted off the hook to attract the attention of the operator. Another salient point is its ability to reach instantaneously an audience numbering into the millions. In the future, if a President of the United States has a vital message for the nation it will be possible for him to address Congress and at the same time let all Americans from Maine to California, as well as the ships at sea, hear his voice at the same instant it is spoken in Washington.

In Radio Touch with Motor Cars



(C. Central News)

Tests were made recently at Brooklands, England, to receive radio messages from motorcar racers who were attempting to break endurance tests by traveling for twelve consecutive hours. The photograph shows the receiving set at the edge of the race track where the tests were made. The voices of the motorcar drivers and mechanics were perfectly heard.

"Sampaio Correio," hydroplane, in its flight from New York to Rio de Janeiro, Brazil, was equipped with a radio-receiving set by the General Electric Company, capable of receiving signals for a distance of 1,000 miles. Special weather reports, daily, from American stations and from a new station recently opened in Brazil were of great help to the navigators on this long flight. They also received daily news reports from the United States Naval stations to the ships at sea. So that signals might be received while "Sampaio Correio" is at rest on the water, as well as when in flight, the aerial may be strung over the top wing, being attached to the skid fins. This provides a spread of about 90 feet. Ordinarily, with an airplane, the aerial is dropped from the body of the plane from a reel; but with a seaplane such an aerial would prevent use of the radio set except when in flight.

Dramatic productions by radio have become a possibility as a result of successful experiments made recently at WGY, radio broadcasting station of the General Electric Company, Schenectady, N. Y. Eugene Walter's play, "The Wolf," was presented. The invisible audience found the story of the invisible players so interesting that many letters have been received at the G-E station proclaiming the success of the "production." The cast was headed by Edward H. Smith, who has been heard frequently in readings by the WGY audience. "The Wolf" was presented in three episodes and the scenes, period, costumes and the story of "before the play" were described briefly preceding the performance. By means of the description the attentive listener at his receiving set constructed his own scenery within the limits of his experience and imagination. To the man who can attend a theatrical production at any time the radio drama may lose something, the story may need the eye to give it full force. There are thousands in rural districts, many invalids, the blind and inmates of institutions to whom all entertainment provided by a broadcasting station is the only relief from monotony. To such as these a dramatic performance by radio has a special appeal.

A convicted life prisoner heard information by radio that, probably, will bring his freedom when George Rollins, convicted of murder, was listening in on his little radio set on the evening of August 10. Rollins, in his cell, was listening to the regular late news broadcast from the Amrad Station, WGI, at Medford Hillside, Mass. Announcement was made that Governor Sproul of Pennsylvania was to release Frank Smith, alias Jesse Murphy, who confessed some months ago to one of the two murders of which Rollins was convicted. The two killings occurred in February, 1917, for which no one has yet paid the penalty. Rollins and his brother, Charles, were both implicated and convicted. While George was awaiting sentence, Murphy, down in Pennsylvania, confessed to one of the murders. While he did not confess to the killing with which George Rollins is convicted, he has positively stated that Rollins did not do it, and that he, Murphy, knows who did. Naturally, George Rollins secured a new lease on life when he heard the news by radio that Murphy was about to be released from the Philadelphia Penitentiary and would be brought to justice in Boston. Boston officials went to Philadelphia to apprehend Murphy and bring him to Massachusetts.

Radio and the Woman

By
Crystal D. Tector

WELL, fellow radioists and friends, this is my last week at Lake Hopatcong. When this batch of "copy" for RADIO WORLD leaves the typewriter, I shall begin to pack my duds and Friend Husband's summer essentials and my good old receiving set, and hike back to the big city. It has been very pleasant up here despite an unusually rainy summer. I have made a lot of converts to radio, and every convert has smothered me with thanks.

The only "sour face" was a woman who took umbrage at the rain. She is that type of female who revels in the blues whenever a cloud obscures the sky; and she told me, with no little degree of genuine anger, that "if it were not for all this radio foolishness, there wouldn't be half so much rain!"

Of course that is all buncombe. Whoever started that report must have had some unusual convolution in what he calls his brain. F. H. says the hootch that is passed around nowadays will make some people say most anything. Be that as it may, when my belligerent neighbor appeared at my door with her tirade against radio, I quietly called her into the house, brought her a cup of my very best tea, and then began to reason with her.

"Do you know," I said, in my sweetest tones, "that radio isn't new, that it is as old as the world itself, that it has always been in the air?"

"No," she replied, her eyes bulging.

"Well, that's the truth," I went on. "Radio has always been; but it took mankind many centuries to discover its existence. And when it was discovered, it was put to use. The fact that is was put to practical use has no more to do with the fact that there is an unusual rainy season than it has to do with the dark side of the moon. There may be other phenomena beyond radio—phenomena even more potent and mysterious than radio will lead us into. We do not know where all this will end. Only fifteen short years ago, we would have been pointed at as foolish if we had dared to suggest things that are now matter-of-fact."

She looked at me almost blankly as she sipped her tea. "Why, I never heard a woman talk like that before," she remarked with trembling voice. She was stunned. I hope that she learned something.

I have not yet told F. H. about this incident. I want him to read it here first. But I ask you, my big family of readers: "Is my answer correct?"

F. H. and I were guests on a long motor tour last Sunday. We started early. The day dawned none too propitiously; but toward ten o'clock the sun came out and the east wind vanished. We motored as far as Philadelphia, where we had luncheon, and re-

turned to the Lake for dinner. But what I want to speak of is the unusual number of antennae I saw strung from the roofs of houses both in the country and the more thickly settled districts. It made me very happy to see this marked interest in the new science. Wherever I noticed a house that was not equipped with those long wires that catch the broadcast sounds, I just wanted to stop and find out why radio had been overlooked. Then I consoled myself that, perhaps, those homes were equipped with indoor aerials. Anyhow, I'll give them the benefit of the doubt.

I am told that the Christmas gifts for women, this year, will include a variety of handsome boudoir radio-sets in nickel and silver—also a few gold finished for those who wish to do something extravagant. When I return to the big town, I will have a chance to make a trip along the Avenue and pick up the latest in radio effects.

A friend writes me from Paris that Mme. Curie, the discoverer of radium, has become an ardent radio fan. They say that she is endeavoring to find out if there is any connection between it and the wonderful mineral that broadcast her name into the ages.

I am informed, also, that the queen of the Belgians is doing much to promote an interest in radio in her country—perhaps the most backward country, so far as all forms of wireless are concerned, of any in the world. The Belgian king, you know, is a keen aviator, and has taken the queen with him on many of his air trips. They say that, wishing to be up-to-date in something, she has decided that radio offers the greatest possibilities.

From my mail bag:

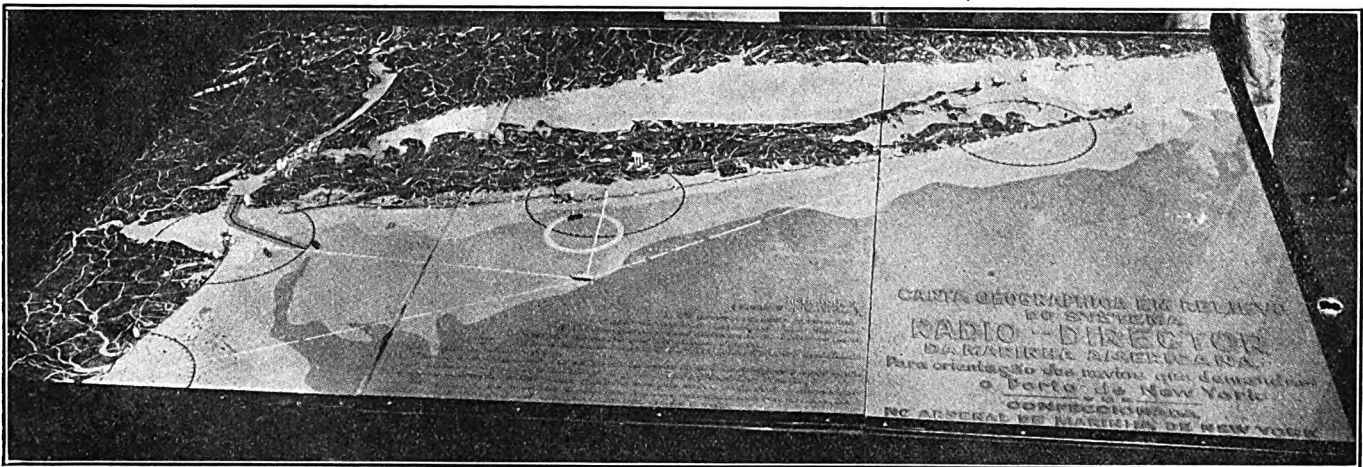
Miss D. E. R., El Paso, Texas.—"I am experimenting with the Armstrong superregenerative circuit as described in RADIO WORLD. It is exceptionally interesting. I was an ardent horsewoman until radio came along. Now 'Dobbin' has nothing to do but eat oats."

Mrs. O. L. I., Des Moines, Iowa.—"Don't think that New Jersey is the only State in which the school children are taking to radio in large numbers. Iowa boasts of just as keen an interest. I am a school teacher, and I should know."

Jane D., Holyoke, Mass.—"It must be bully to get along with him you call 'Friend Husband' so placidly as your articles indicate. Has radio anything to do with it? If so, I'll install a set at once."

Mrs. K. Y. J., Indianapolis.—"My boy has just left for New York to seek a position on an ocean liner, as radio operator. You can imagine what that means to a mother—to see her boy leave the old home and embark in a new field, with only his health and determination. I wish I could send him to you. He begs me not to worry and fret, and swears that he will succeed. He really knows a great deal about radio, so I have no fear if he does find employment. But—I am his mother."

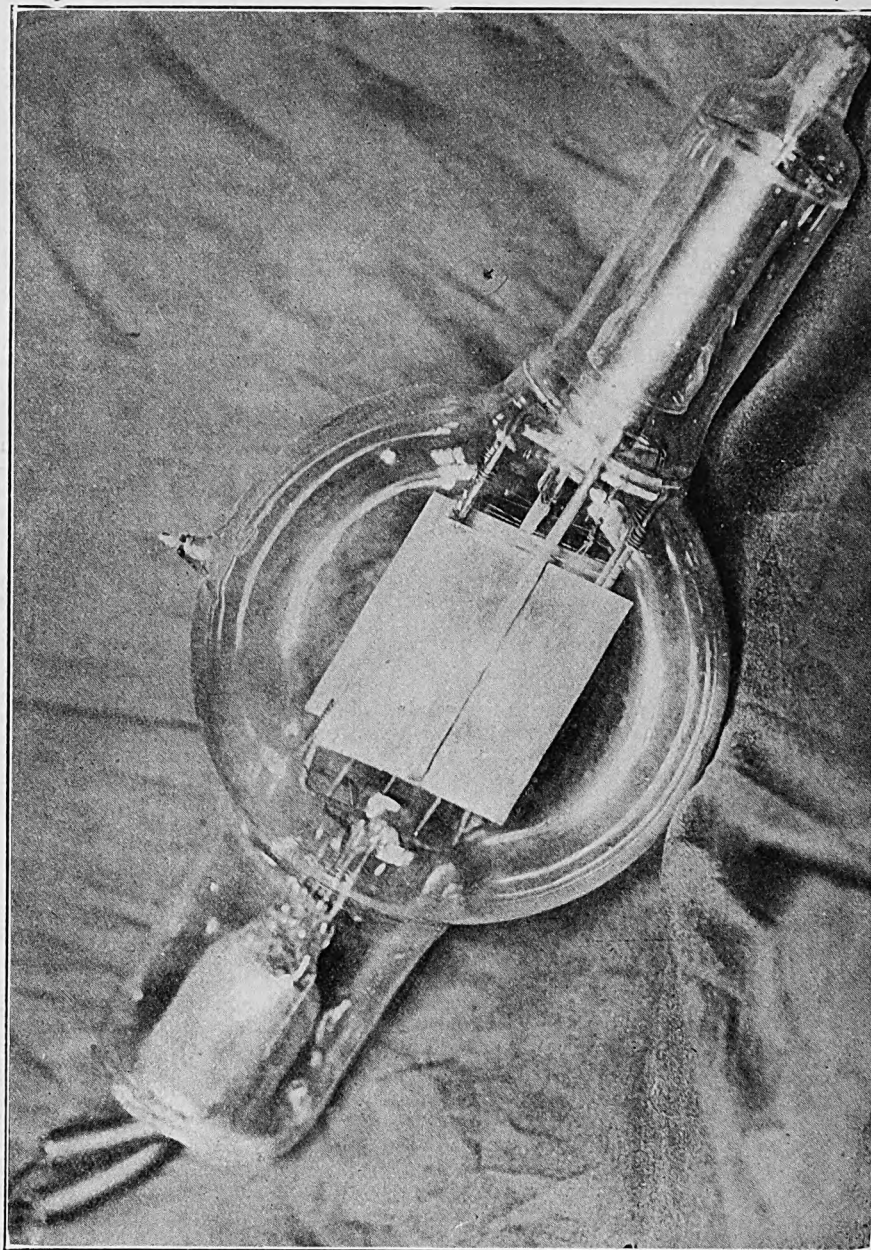
United States Navy's Radio Relief Map of New York Harbor



(C. International News Reel Photos.)

The above photograph shows the United States Navy radio-relief map of New York Harbor, recently finished at the Brooklyn Navy Yard, New York. This map is complete in every minute detail, even displaying the various lighthouses along the Long Island and New Jersey coasts as well as buoys, channels and shoals.

The Vacuum Tube and Its Evolution

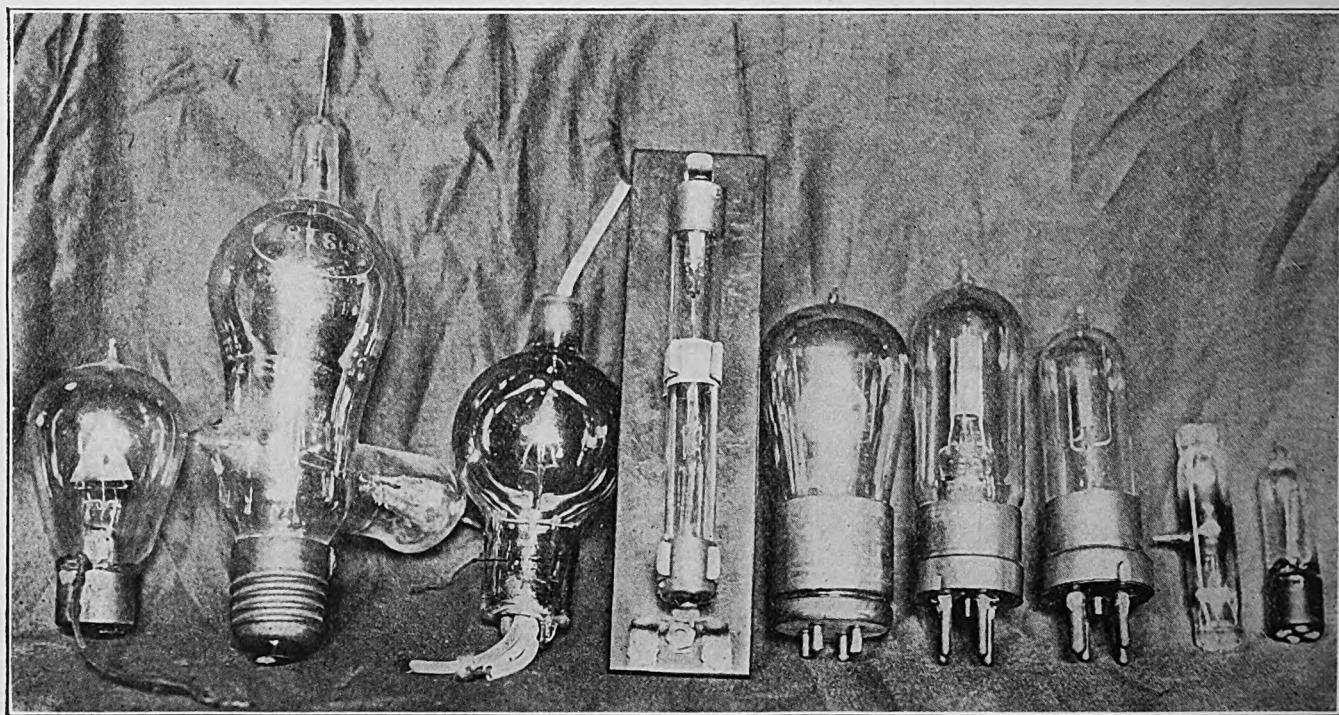


CONTINUOUS-WAVE telegraphy and telephony are now universally recognized as the best method of transmission. The difficulty of transmitting clearly through static interference is greatly overcome by the use of this type of signal. Prior to the introduction of the vacuum tube, the generation of continuous waves was extremely difficult. The introduction on the market of the tube known as the plotron, in the photograph at the left, has simplified and rendered possible this extremely valuable method of communication. This tube to-day is supplanting most of the high-powered radio stations and is taking the place of the old-time arc transmitter. It can be used either for continuous-wave telegraphy or telephony.

The photograph across the bottom of the page gives a clear idea of the evolution of the vacuum tube from Dr. Fleming's invention, the two-element electrode valve, to the de Forest invention, the three-electrode vacuum tube. They are all of the three-element type, but are the designs of different manufacturers.

Perhaps no particular item is as responsible for the advancement of radiotelegraphy and telephony as the vacuum tube. This instrument was perfected about 1910. Since that time it has been used with great care with wonderful results. It consists of an evacuated vessel somewhat similar in size and construction to a small incandescent lamp. Instead of two connections, as in the case of the electric lamp, the vacuum tube—or, more properly, the electron tube—has four. Two of these serve the same connections as that of the lamp, while the other two connections are for the leads to the grid and plate of the tube. There are, therefore, three elements in the vacuum tube: namely, filament, grid, and plate.

(Both photographs copyrighted by Central News Photo Service)



Real Test for Transatlantic Radio Circuits

Radio Corporation of America Expects to Handle Bulk of Messages, without Delay, While Cable Service Is Interrupted

By Carl Hawes Butman

WASHINGTON, D. C.—“An ill wind” may blow radio communication “some good.” In fact it is very likely that the seizure of ten transatlantic cables by the Irish irregulars, reported by the Associated Press, leaving but seven to carry all the Old World news and dispatches, may give radio communication the opportunity it needs to show what it can do, especially in an emergency. And, to date, it is reported that the Radio Corporation of America is clearing all its transatlantic messages filed between Great Britain and North America without delay.

Officials of the Radio Corporation of America, in Washington, say they welcome the opportunity to handle the increased traffic and feel that after two and a half years' operation they at least can handle their share. Ordinarily the R. C. of A. carries between twenty and twenty-five per cent. of the transatlantic traffic, but now it may get about seventy per cent.

The five commercial cables seized in Ireland terminate in Waterville, the four Western Union at Valentia, and the British cable at Ballinskelligs. The trouble seems to be that if the government forces attempt to regain the stations the rebels will destroy them, as was the case with the Marconi station at Clifden, which operated to Canada. The three remaining cables direct to Penzance, England, became overloaded at once and the only radio circuit in operation, that of Carnarvon, is busy day and night.

Radio Corporation officials admit, however, that the Carnarvon station must handle both Canadian and United States dispatches, although stations on this continent can relay messages between United States and Canadian points. The radio system is more flexible than cable communications, they point out, and when one station is loaded part of its work may be transferred to another. High-speed transmission will enable the radio stations to carry great numbers of messages in periods free from interference, and practically no delay is anticipated.

The only other means of communication between the old and new worlds are the three French cables which land at Brest, and one commercial cable to

the Azores and Lisbon, which usually serves the Mediterranean.

Radio stations in Europe and England are used for sending and receiving from specific sections. For example, the new station at Ongar, England, serves the Continent and Europe; while that at Carnarvon, Wales, operates to Canada and the United States and the British Postal Radio circuit, near Oxford, handles Egyptian traffic.

It would seem that the Radio Corporation of America can handle the American end of the transatlantic traffic, with little trouble, and the stations at Marion, Mass.; Tuckerton and New Brunswick, N. J.; and Port Jefferson,

L. I., will send; while the receiving station at Riverhead, L. I., will do the receiving from Carnarvon, Bordeaux, Stavanger, Norway and Nauen and Eilvesse, Germany.

Recently the French-American circuit was shifted from Bordeaux to St. Assise. After a test conducted with this country the station was opened for operation with co-operation of R. C. of A. stations. It is reported that the new radio-station just about completed at Bruges may go into circuit with the R. C. of A. stations; it is the first high-powered transmitting station in Belgium and may prove a valuable adjunct in the present emergency.

Table Explaining the Units of Copper Wire

RADIO WORLD publishes herewith a table which should be of interest to all radio amateurs. It gives the necessary data for using copper wire from size 0000 to No. 40. This table gives the diameter of the various wires, also the capacity, ohms and feet per pound:

GAUGE	DIAMETER	SECTIONAL AREA	CAPACITY	OHMS.			FEET		POUNDS	
				Per 1,000 Ft.	Per Mile	Per Pound	Per Pound	Per Ohm.	Per 1,000 Ft.	Per Ohm.
B. & S.	In	In Circu- lar Mills.	In Amp.							
No. 0000	.460	211600.	312.	.04906	.25903	.000077	1.56122	20497.7	640.51	12987.
000	.40964	167805.	262.	.06186	.32664	.00012	1.9687	16255.27	507.95	8333.
00	.3648	133079.	220.	.07801	.41187	.00019	2.4824	12891.37	402.83	5263.
0	.32486	105534.	185.	.09831	.51909	.00031	3.1303	10223.08	319.45	3225.
1	.2893	83694.	156.	.12404	.65490	.00049	3.94714	8107.49	253.34	2041.
2	.25763	66373.	131.	.1563	.8258	.00078	4.97722	6429.58	200.91	1282.
3	.22942	52634.	110.	.19723	1.0414	.00125	6.2765	5098.61	159.32	800.
4	.20431	41743.	92.3	.24869	1.313	.00198	7.9141	4043.6	126.35	505.
5	.18194	33102.	77.6	.31361	1.655	.00314	9.97983	3206.61	100.20	318.
6	.16202	26251.	65.2	.39546	2.088	.00499	12.5847	2542.89	79.462	200.
7	.14428	20817.	54.8	.49871	2.633	.00792	15.8696	2015.51	63.013	126.
8	.12849	16510.	46.1	.6529	3.3	.0125	20.0097	1599.3	49.976	80.
9	.11443	13094.	38.7	.8792	4.1	.0197	25.229	1268.44	39.636	50.
10	.10189	10382.	32.5	.8441	4.4	.0270	31.8212	1055.66	31.426	37.
11	.090742	8234.	27.3	1.254	6.4	.0501	40.1202	797.649	24.924	20.
12	.080808	6530.	23.	1.580	8.3	.079	50.5906	632.555	19.766	12.65
13	.071961	5178.	19.3	1.995	10.4	.127	63.7948	501.63	15.674	7.87
14	.064084	4107.	16.2	2.504	13.2	.200	80.4415	397.822	12.435	5.00
15	.057068	3257.	13.6	3.172	16.7	.320	101.4365	315.482	9.859	3.12
16	.05082	2583.	11.5	4.001	23.	.512	127.12	250.184	7.819	1.95
17	.045257	2048.	9.6	5.04	26.	.811	161.29	198.409	6.199	1.23
18	.040303	1624.	8.1	6.36	33.	1.29	203.374	157.35	4.916	.775
19	.03589	1288.	....	8.25	43.	2.11	256.468	124.777	3.899	.473
20	.031961	1021.	....	10.12	53.	3.27	323.399	98.9533	3.094	.305
21	.028462	810.	....	12.76	68.	5.20	407.815	78.473	2.452	.192
22	.025347	642.	....	16.25	85.	8.35	514.193	62.236	1.945	.119
23	.022571	509.	....	20.30	108.	13.3	648.452	49.3504	1.542	.075
24	.0201	404.	....	25.60	135.	20.9	817.688	39.1365	1.223	.047
25	.0179	320.	....	32.2	170.	33.2	1031.038	31.0381	.9699	.030
26	.01594	254.	....	40.7	214.	52.9	1300.180	24.6131	.7692	.0187
27	.014195	201.	....	51.3	270.	84.2	1639.49	19.5191	.6099	.0118
28	.012641	159.8	....	64.8	343.	134.	2067.364	15.4793	.4837	.0074
29	.011257	126.7	....	81.6	432.	213.	2606.959	12.2854	.3835	.0047
30	.010025	100.5	....	103.	538.	338.	3287.084	9.7355	.3002	.0029
31	.008928	79.7	....	130.	685.	539.	4414.49	7.72143	.2413	.0018
32	.00795	63.	....	164.	865.	856.	5226.915	6.12243	.1913	.0011
33	.00708	50.1	....	206.	1033.	1147.	6590.41	4.85575	.1517	.00076
34	.006304	39.74	....	260.	1389.	2166.	8312.8	3.84966	.1204	.00046
35	.005614	31.5	....	328.	1820.	3521.	10481.77	3.05305	.0956	.00028
36	.005	25.	....	414.	2200.	5469.	13214.16	2.4217	.0757	.00018
37	.004453	19.8	....	523.	2765.	8742.	16659.97	1.92086	.06003	.00011
38	.003965	15.72	....	660.	3486.	13772.	21013.25	1.52292	.04758	.00007
39	.003531	12.47	....	832.	4395.	21896.	26496.237	1.20777	.03755	.00004
40	.003144	9.88	....	1049.	5542.	34823.	33420.63	0.97984	.02992	.00002

The Radio Primer

A Weekly A. B. C. of Radio for the Beginner, in which Elementary Facts and Principles Are Fully and Tersely Explained and all Words and Terms Used by Amateurs and Experts Defined

The Beginner's Catechism

By Edward Linwood

WHAT is the advantage of overloading a power tube?

Most beginners are tempted to force the oscillator tube to generate higher power oscillations than were originally intended. This will weaken the life of the tube and, in the final run, it will burn out. You force the power tube when you increase the filament current or brightness and add voltage to the plate. The safest way to overcome this is to connect two oscillator tubes in parallel and then cut down the filament brilliancy a little.

* * *

Can a spark from a coil, or buzzer, be used in connection with tube transmitters?

In a radiotelephone transmitting circuit, a modulator tube is employed and a buzzer often substituted for the microphone when sending out ICW—interrupted continuous waves.

* * *

How are the filaments of power tubes excited?

The filaments of power tubes are usually, or preferably, energized by alternating currents. This prolongs the life of the tubes. If alternating current is not available, the filaments may be lit by a supply of direct current. The filament of a power tube will have its life prolonged if alternating current is used and particularly if the filament voltage is maintained at constant value.

* * *

What is the depending factor of a power tube?

The life of a power tube depends on proper operation. Do not use a greater voltage on the filament than that specified, and do not overload the plate by employing an excessive plate-voltage; that is, if you want long life. Power-tube filaments should be burned at constant voltage rather than constant current. This will prolong their useful life. It is also dependent on its temperature. A three per cent. increase will diminish the life of your tubes one-half, while a three per cent. increase will double the life.

* * *

How should power tubes be suspended when in use?

The life of a power tube may be prolonged if suspended in the proper position. Radiotrons, type UV 202 and UV 203, should be operated in a vertical position, whereas UV 204 may be operated in both a vertical and horizontal position. If mounted horizontally, the plates should lie in a vertical plane, with the seal off, tip down.

* * *

What care should be taken in insulating the grid and plate leads when transmitting?

Great care should be taken to thoroughly insulate the grid and plate leads to the tube and coils sectors connected to these leads. Where high-frequency potential rages, this must be done to secure safety and efficiency.

* * *

How are most of the power tubes burned out?

A majority of accidents to power tubes and their auxiliary apparatus occur during the development of circuits, testing, and adjustment, rather than during operation. If care is exercised in making these adjustments, probably the tubes will not burn out so readily, saving the expense of new tubes.

Radio World's Revised Radio Dictionary

By Fred. Chas. Ehlert

Tap—A steel tool used for inside threading.

Taper—Smaller at one end than at the other.

Taut—To stretch tight, as "A taut aerial."

Telephone Cord—A number of thin copper wires twisted together having a silk, or cotton, covering woven about them. Usually used to connect telephone receivers with receiver.

Telegraph Key—A device for making and breaking a circuit in a transmitting line. This action interrupts the flow of current for making dots and dashes in the telegraph code.

Thermo Ammeter—An instrument that employs two dissimilar metals; a heated junction which sets up an E. M. F., in which case it is measured by a D-C voltmeter.

Thermo-couple—A junction of two different metals.

Tickler Coil—A coil of wire placed in the plate circuit of a receiver which enables it to be fed back to the grid circuit. This produces regeneration and enables the tube to generate oscillations of high frequency.

Tone Frequency—Same as spark frequency.

Trains of Waves—Electric waves which follow one another at regular intervals. Each electric oscillation sends out an electric wave. Hence, as several oscillations take place before all the energy is damped out, an equal number of electric waves will be sent out. This makes up a train of waves.

Transferred Energy—The energy flowing in a primary circuit or coil which is changed over to current which is set up in the secondary coil or circuit. Induction takes place by transfer of energy.

Transformer—Any device used in electrical and radio circuits for the transferring of current from one circuit to another, with or without a change in voltage. There is the Power Transformer, Amplifying Transformer, Telephone Transformer, Tuning Transformer, Oscillation Transformer and others. These transformers have a primary and secondary winding. The primary winding receives the initial current which it passes on to the secondary winding with the same voltage, higher voltage, or lower voltage, according to the ratio the primary and secondary windings bear toward each other.

Tuned Open Circuit—A tuned aerial wire-system.

Table of Enameled Wire for Winding Coils

THE number of feet in each pound of enameled wire of various sizes is given in the appended table. The beginner will find this table useful when computing the data for winding coils.

No. of Wire B. & S. Gauge	Turns per Linear Inch	Turns per Square Inch	Ohms per Cubic Inch of Winding	Feet Per Lb.
20	30	885	7.48	320
22	37	1,400	1.88	509
24	46	2,160	4.60	810
26	58	3,460	11.80	1,286
28	73	5,400	29.20	2,042
30	91	8,260	70.90	3,240
32	116	21,000	7547.00	5,132
34	145	13,430	2968.00	8,093
36	178	31,820	109.80	12,813
38	232	54,080	456.00	20,274
40	294	86,500	183.00	32,107

Answers to Readers

MY aerial is 90 feet long, in the shape of a V, and, approximately 50 feet high. My set is a short-wave receiver of the regenerative type with one-stage of amplification. It has a wave length of 400 meters. I get all sorts of tube noises and howling, and plenty of CW and spark stations, yet I cannot pick up the stations I wish to hear. What is the trouble?—Arthur Rumshaw, Pittsburgh.

Your aerial should be erected so that one wire, about 100 feet long, is run out in one stretch. In case of an inverted L type the lead-in should be taken off the end that points towards the broadcasting station. The noises you are encountering are generated from your tubes and are laid to improper plate or filament voltages, more or less on the plate side of the tube.

What type set should I purchase between the prices of \$100 to \$300.—Maurice Bookmaker, Schenectady, N. Y.

A vacuum-tube receiver, including a two-step amplifier of the regeneration type, with a good aerial, should prove sufficiently efficient for your purpose. Be sure you get a regenerative set when you buy. Prices range from \$100 to \$300.

What is static?—K. L. G., Roslyn, L. I.
This question seems to puzzle many radio enthusiasts, though explanatory articles regarding it have been published from week to week in RADIO WORLD. The term, as used by radio engineers, refers to atmospheric and electric effects which produce, in radio-receiving circuits, currents of a nature which interfere with, or disturb, incoming radiotelegraph signals. The standardization committee of the Institute of Radio Engineers has defined static thus: Static is conduction, or charging current, in the antenna system resulting from physical contact between the antenna and charged bodies, or masses, of gas.

When a tickler coil is used, is it necessary to have it near the receiving coils of a loose coupler or may it be placed anywhere on the panel?—J. C. S., Boston.

The tickler coil should be placed, or mounted, so that the coupling between this coil and the secondary is adjustable.

Could AC be used for filament, or grid, of a 50-watt power-tube?—M. V. E., Amagansett, N. Y.

AC may be used to light the filament of a power tube, but a D-C voltage is needed for the grid voltage.

I have a loose coupler and galena detector. All I hear is code. Why? Am close to a broadcasting station.—Hiram Hopkins, Canastota, N. Y.

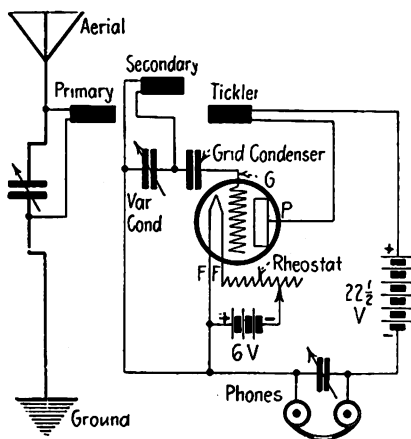
Put variable condenser in series with antenna and get a better crystal. Adjust your set properly.

If a station broadcasts a message on a wave length of 600 meters and I tune up to 600 meters, can I pick up the message regardless of the distance between me and the distance station, even if it is a distance of 1,000 miles?—Reader of RADIO WORLD, Grand Rapids, Mich.

This question is difficult to answer as efficiency plays an important role. If you had your set tuned to the same wave

as that of a transmitting station, it is possible that you can receive the message provided that the transmitting station has enough power to cover a certain distance and that the receiver is such that it is able to pick up weak distance signals. Generally with a well-made regenerative receiver with two or three stages of amplification, signals are received over thousands of miles. While at a Naval Station I have received signals myself over two thousand miles, employing a regenerative receiver with three stages of amplification. Everything depends on the receiver, location, weather conditions, and the power of the transmitting station.

My set consists of three honeycomb coils, two variable condensers, one grid-condenser, one 22½-volt B battery, one 6-volt A battery, tube, socket and phones. What is the hook-up?—Ralph Robinson, Jamaica, N. Y.



The accompanying circuit shows the hook-up which you are desirous of obtaining. The variable condensers may be used in series, or parallel, which provides the tuning qualities of the coils to a given wave length.

I have a short-wave regenerative set with a two-step amplifier. Is there any way by which I could put a variable grid leak on it? Would a three-plate vernier condenser do for this purpose?—Richard Creter, Madison, Conn.

A variable grid-leak may be had at any radio shop and placed in shunt, or parallel, to the grid condenser at the grid of the first tube, better known as the detector tube. The vernier is of no use as a grid leak.

I would like to purchase a receiving set, but have no place to erect an aerial. Could I receive from Pittsburgh, 186 miles away, with a loop aerial?—Robert Delp, Carlisle, Pa.

Concerts have been heard over this distance using radio frequency employing a loop aerial. It is doubtful whether you can receive concerts, using audio frequency with the loop. We suggest that you do not attempt this. Use radio frequency and audio combined.

What are the number of turns of No. 24 D.C.C. wire to use on each side of stator of variometer and on each side of rotor? Number of turns on rotor of vario-

coupler? Is the variocoupler of 180 degrees better than the ordinary variocoupler in the supergenerative set? In the set shown in RADIO WORLD, dated May 20, can I use the Western Electric V.T. 1, (J) tube, or will I have to use a soft tube?—A. C. Thomas, North Birmingham, Ala.

Variometers are of different sizes. It is hard to calculate the exact number of turns for the stator and rotor. Usually the rotor has a few more turns than the stator. Thirty-five to forty turns should be used on rotor with approximately a few turns less on stator.

The number of turns on secondary should be in proportion to the primary and, also to what wave lengths desired. More data should be furnished on this variocoupler.

A 180-degree variocoupler is best as it affords closer tuning.

Yes. A J-tube may be used as a soft tube. These tubes are used at the Government stations as detectors and amplifiers.

Can I use an electric-light line as an aerial? If so, what do I need. Does Ducon answer this purpose?—George Sayers, Oconto, Wis.

You may use the ordinary electric-light if simple precautions are taken. The Ducon answers the purpose, but if other instruments are used be careful. Remember you are dealing with 110 volts of alternating current.

Can a B battery be made of a sufficient number of dry cells? Would there be a great deal of howling? If so, could this howling be overcome by packing, say 15 cells of 1½ volts each in a box of dry sand and then sealed air-tight with sealing compound?—Enno Schuelke, Greensboro, N. C.

B batteries may be made up in this manner but it would be a bulky job. Usually flashlight batteries are used because they occupy smaller space.

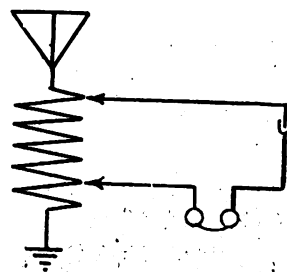
I am planning to assemble the following parts for a new regenerative radio-set and would like the best possible hook-up and panel layout with sufficient drawings for placing wires and apparatus properly.—Kenneth H. Jones, London Mills, Illinois.

The assembling of such a set was described in RADIO WORLD, No. 7, dated May 13, in "My Practical Detector and Two-Stage Amplifier," by Frederick J. Rumford.

Can I connect a loop aerial with a crystal set? Can a variable condenser be used on a crystal set?—John Sinnott, Cleveland.

A loop aerial cannot be used with a crystal set. Use an outside antenna. Variable condensers may be used in your receiver. One may be used in shunt or parallel to the secondary winding of your vario-coupler or loose coupler which is .0005 microfarad capacity and the other in series with the antenna circuit which should be .001 microfarads.

Will you publish a diagram of a crystal receiver employing a single-slide or double-slide tuning coil?—Harold McCumber, St. Mary's, Ga.

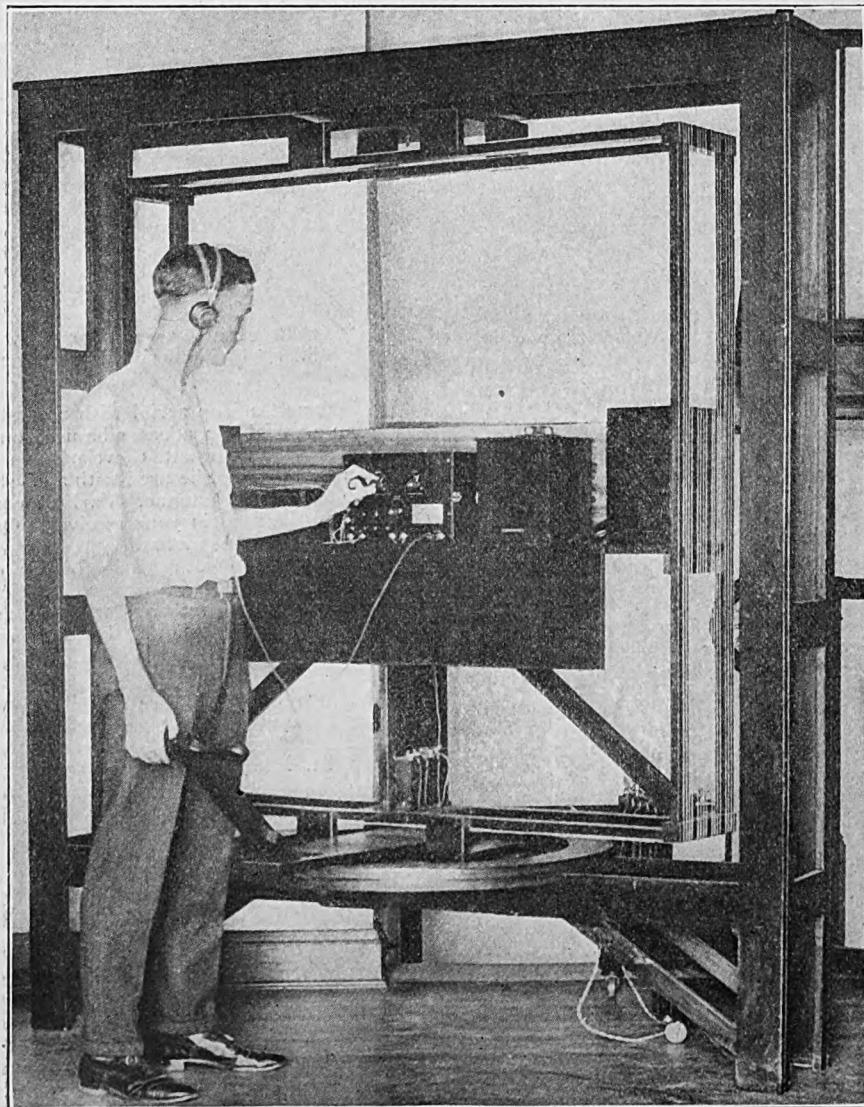


The accompanying diagram shows the necessary circuit you are seeking.

Uncle Sam Doing Big Things in Radio



(Both photographs, C. Underwood & Underwood, N. Y.)

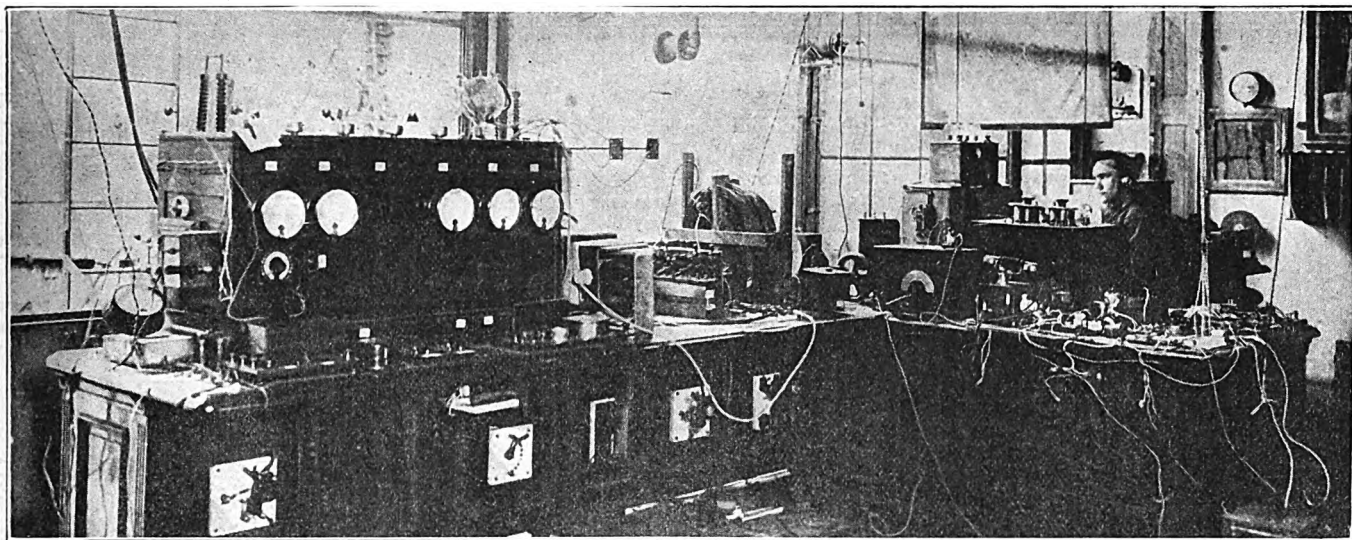


The United States Bureau of Standards, Washington, D. C., is undoubtedly the clearing house for radio in the United States. Its chief is Dr. W. S. Stratton. And he is the busiest chief this busy bureau ever had because radio is gaining in popularity at such a rapid rate. So far as radio is concerned, the Bureau of Standards is the connecting link between the American people and their government. Besides dealing in matters of an economic nature, the bureau is busy constantly with new apparatus. In the upper photograph, Dr. Stratton is shown receiving messages on a 9-inch coil-antenna and reading its position on the graduated scale. This apparatus may be used as a direction finder to determine the position of a transmitting station. The amplifier shown employs six tubes, so that stations several hundred miles distant may be received.

The photograph at the lower left-hand corner is that of a giant direction finder which, it may be said, turns eyes into ears. F. H. Engel, of the bureau, has been active in the development of the big 5-foot coil-antenna and direction finder, before which he is standing. This type of antenna eliminates from radio the necessity of an elevated antenna outdoors. By rotating the coil, positions may be determined with a high degree of accuracy. Such a device enables a ship to safely enter a harbor in the densest fog—the pilot steering by sound.

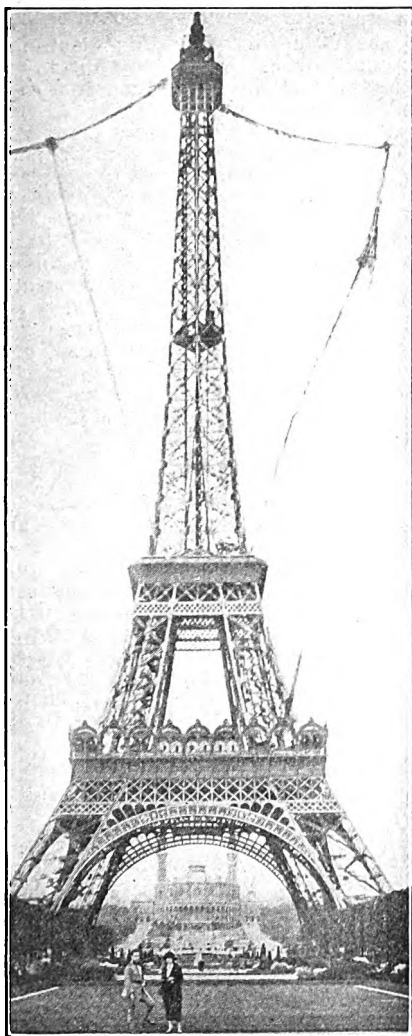
These loop aerials are used exclusively in all radio-compass stations of the United States Navy. Compass bearings are furnished to prove the exact position of vessel at the time the vessel's bearings were taken. This can be accomplished by the aid of the loop aerial. The marked advantage of the loop aerial is the eliminating of a large percentage of undesired traffic and the lessening of static to a certain degree. Some very good work has been done by compass stations situated at the entrance of New York Harbor.

Eiffel Tower's High-Power Station—FL



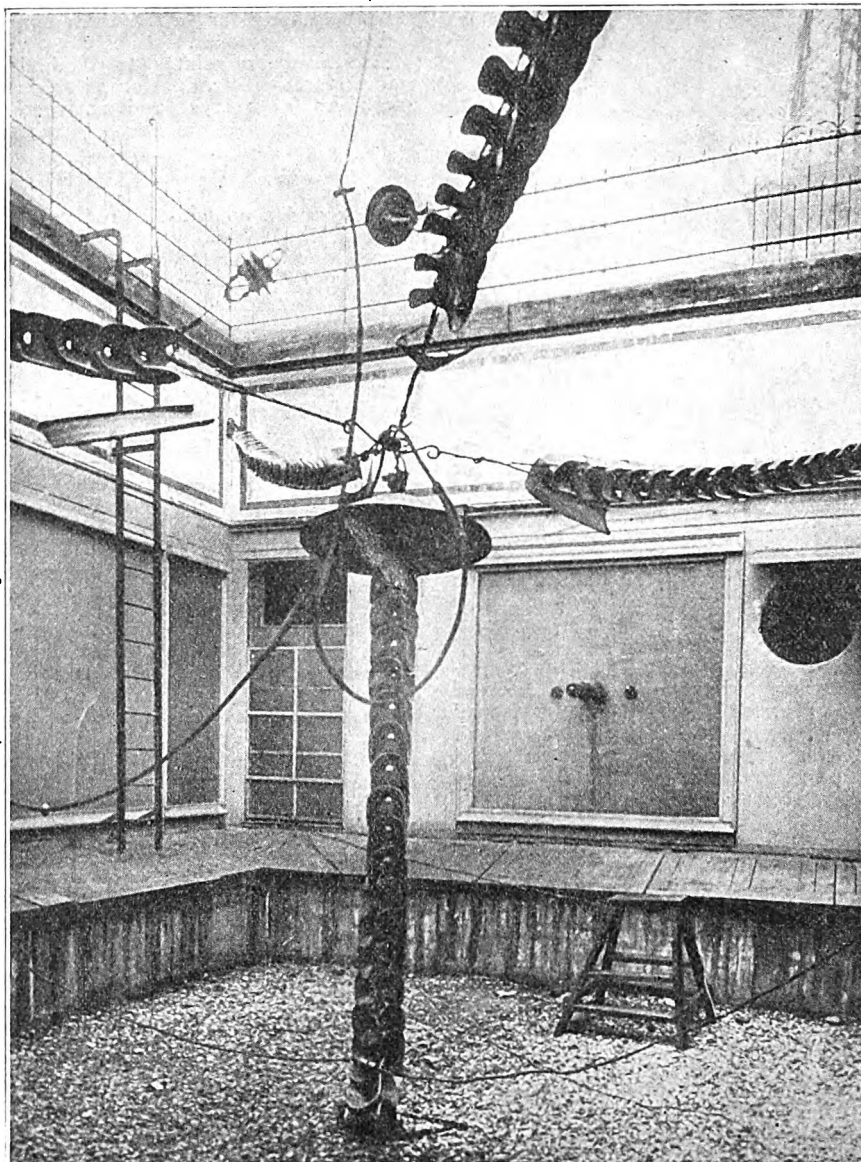
(C. Central News Photo Service)

Interior view of an important section of the great radio station installed on top of the world's highest structure, the Eiffel Tower, Paris. This station is under direct control of the French government. It played an important part during the World War. This photograph is the first taken since 1914. To the left is the tube-transmitting set. At the right is the powerful receiving-equipment. Time signals and news are broadcast daily. All vessels equipped with radio are familiar with its call letters—FL. It is the only high-power station in the world with a two-letter call.



(C. Kadel & Herbert News Service)

The Eiffel Tower and its famous station—FL. At the top of this great tower are the aerials which enable the radio operators to keep in constant communication with vessels at sea. Its time signals have been copied over a thousand miles away.



(C. Central News Photo Service)

Massive insulators used in connection with the lead-in wires. These need not be very large for receiving purposes, but should be to preserve the transmitter.

Radio Patents

Roy Weagant Invents Important Device for Reducing Static Interference

No. 1,425,154. Patented August 8, 1922.
Patentee: Roy Alexander Weagant, New York City.

MR. WEAGANT'S present invention is based on observations made by him and described at length in his patent No. 157,594, wherein he states that the so-called static disturbances act as if caused by electromagnetic waves, or impulses, propagated perpendicularly to the surface of the earth, and almost without horizontal components.

"Whether or not this is a correct statement of the facts," says Mr. Weagant, "I find that by proceeding on this assumption and by screening an aerial collector by placing such collector beneath a metallic, or other conducting screen, I am able to very largely

grounded. Experience shows, also, that grounding the screen does not decrease the effect of the signal waves on the receiving apparatus. This is in accordance with my observations to the effect that commercial signal waves extend a material distance beneath the surface of the ground with small diminution in strength."

Mr. Weagant claims that his latest device may be used with any form of antenna. "Moreover," he states, "I do not find it necessary to arrange the loop antenna in a vertical plane when such is used, although the vertical arrangement is preferable."

Three-Electrode Tubes as Amplifiers

No. 1,422,013. Patented July 4, 1922
Patentee: Laurence Beddome Turner, Cambridge, England.

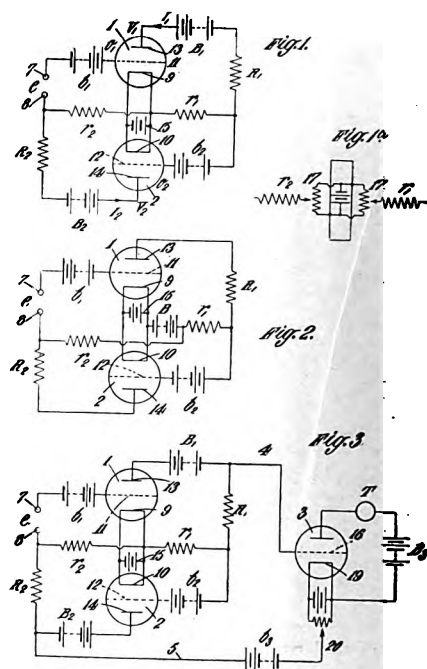
MR. TURNER is the inventor of improvements in thermionic apparatus applicable for wireless telegraphy and other purposes.

His invention relates to methods of using three-electrode ionic tubes as amplifiers or relays, and as rectifiers and generators of alternating currents. Such tubes contain a cathode, or electrode, otherwise made to emit a stream of corpuscles; a repeat-electrode or anode; and a control-electrode or grid; all contained in a vacuum or nearly vacuum envelope.

A simple method of obtaining amplification by such a tube consists in impressing the incoming signal on the grid circuit, an amplified signal being thereby set up in the anode circuit. Unless there is retroaction between anode and grid circuits, the ratio between the repeat and control electromotive forces or currents is limited by the characteristics of the tube. When, however, the signal is of a periodic character and suitable retroaction is provided between the anode and grid circuits in the well known manner, the amplification may be increased indefinitely.

One way of regarding the action of such a retroactive amplifier is to conceive that negative resistances are introduced, so that the net resistance of a circuit is the algebraic sum of the inherent (positive) resistance and the added (negative) resistance due to retroaction. Under suitable conditions the net resistance is thus reducible toward zero by any desired amount. In the well known circuits for periodic currents which are used to a considerable extent in wireless telegraphy, where the retroaction is commonly by magnetic or electric induction, the resistance of a circuit is thus reducible at will for the particular frequency or frequencies to which the circuits are tuned.

Negative resistance may be introduced into a circuit by another ionic tube device, already known under the name of "dynatron," in which the result is effected, not by external retroaction between the control and repeat electrodes of the tube, but by the emission of secondary corpuscles from an electrode subjected to violent bombardment by primary corpuscles. The dynatron is applicable to periodic and to aperiodic circuits and



Three schematic diagrams of Mr. Turner's invention in which vacuum tubes are used as rectifiers and generators of alternating current for wireless telegraph signals.

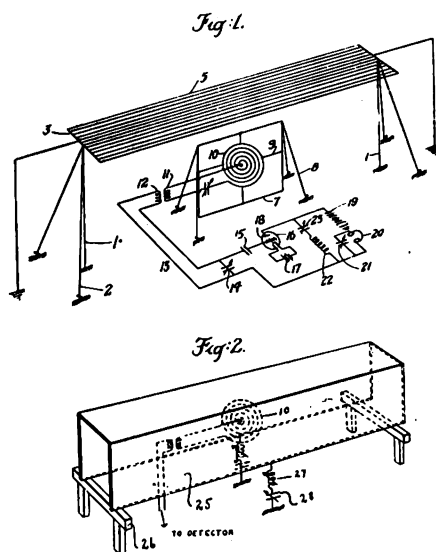
may be used for amplifying electromotive force or current of any form.

The present invention consists of a combination of circuits including two ionic tubes in which secondary emission of corpuscles does not occur, or plays no important part, whereby the same result of negative resistance is obtained as is obtained in the dynatron by dependence or secondary emission. The resistance of a circuit may, by means of the present invention, be approximated as closely to zero as may be desired; and the circuits may be such that substantially the only impedances concerned in the retroaction are resistances, so that the impedance is reduced as far as desired for currents of any form, including steady currents.

The result is attained by resistance retroactions between the anode of a tube and the grid of a second tube, and between the anode of the second tube and the grid of the first tube. A rise of potential of the grid in the first tube produces a rise of current to anode of the said tube, which effects a fall of potential of the grid in the second tube and a fall of current to anode therein, with a consequent rise of potential of the grid in the first tube. Thus any change of potential of grid or anode may be made more or less to sustain itself.

Veterans' Bureau Training in Radio

ALREADY the Veterans' Bureau has rehabilitated a large number of veterans in radio. To date, 282 are in training. Some of these new operators have secured sea employment in the Shipping Board and on privately operated vessels, while others have entered various commercial companies through "Radio Want Ads" broadcast through NOF, Anacostia. The bureau now expects to furnish radio operators for land service from the surplus of radio men trained, which threatens to accumulate. One hundred men have been trained in radio at the Nola Radio School, New Orleans; forty at Loomis Radio School in Washington, and seventy at the Service Radio Institute also in Washington.



Schematic diagrams of Roy A. Weagant's invention for reducing static, for which he makes the following claims:

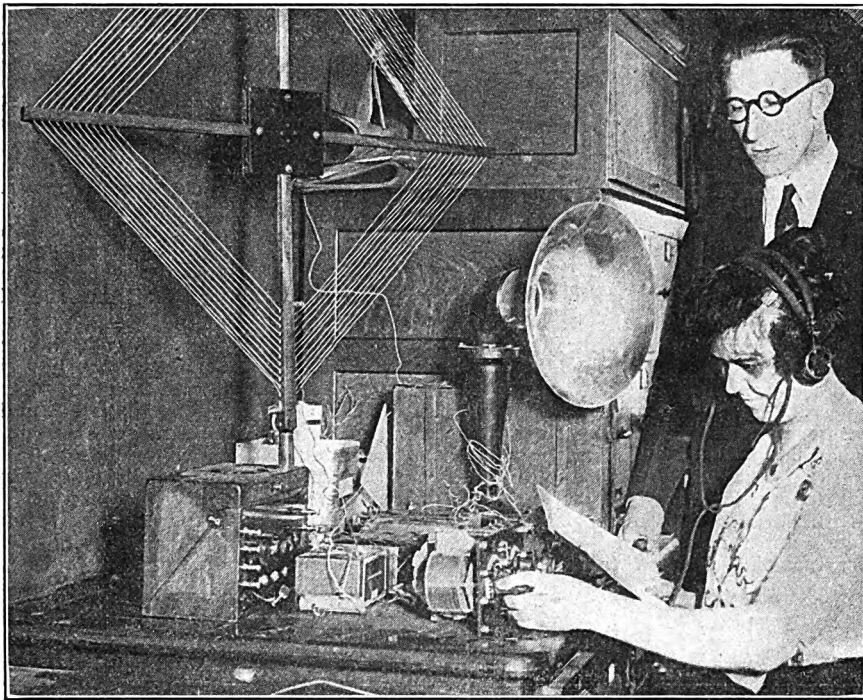
Figure 1—In a radio-signalling apparatus, the combination with an antenna of an open ended inverted trough-shaped screen for protecting the collector from electromagnetic waves moving vertically downward and along a given horizontal line in either direction.

Figure 2—In a radio-signalling apparatus, the combination with a collector of an open ended inverted trough-shaped screen covering said collector above and on two sides, and adjustable grounded circuits connected to the lower edges of said screen at the midpoints thereof.

overcome the interference with the reception of radio signals caused by the most objectionable forms of atmospheric disturbances, the static waves being absorbed by the screen and, consequently, the collector shielded therefrom.

"On the other hand, commercial radio-signal waves travel horizontally or have a large horizontal component of motion, so that by leaving the collector unscreened on the side from which the signal waves approach the receiving station there is practically no change in the effect of the signal waves on the receiving apparatus. I have found, moreover, in practicing this invention that the effectiveness of the screen in absorbing and preventing the passage of static waves is increased if the screen is

Not Necessary for this Sherlock Holmes of the Air to Wear Disguise



(C. Underwood & Underwood, N. Y.)

Edward A. Beane, formerly Federal radio inspector of the Second District of New York, has been appointed radio inspector of the Ninth District of Chicago, where he has every known mechanical device with which he can locate the radio operator who is either unlicensed, or who has "jumped" his wave length—which is somewhat similar to speeding in motoring. He is a Sherlock Holmes of the air. The Federal department is trying, also, to safeguard the public against the many fake wireless instruments being placed on the market. The photograph shows Inspector Beane in his office operating with a direction finder.

Million Marmots Will Whistle for Radio

THE next number on to-night's program will be a piccolo imitation entitled "The Whistling Chorus," by the Rocky Mountains Marmot Singing Society of one million voices."

Such may be the announcement to astonish the ears of any number of listening radio fans in the near future, says an Associated Press dispatch to "The Times," New York, if a proposal before the National Park Services of the Interior Department is carried through. It will be possibly the most novel treat that the numberless radio amateurs could ask, whose apparatus would tune in with a broadcasting station in Glacier National Park, in the heart of the Rockies, which would catch and transmit the shrill whistling of these small doglike animals.

Within fifty miles of the park, in the northern part of Montana, near the Canadian border, resides the largest colony of the animals on the North American continent. It is estimated there are close to a million of them, living in dense population. On still nights the wonderful shrilling chorus of the piccolo-like voices is carried miles on the rare mountain air, and tourists in the camps enjoy the evening programs immensely.

It has been proposed that a receiving and broadcasting station of 200-watt capacity, sending at a 360-metre wave length, be installed close enough to catch the voices clearly. Such power would be capable of sending throughout a radius of 1,500 miles and could be picked up almost from coast to coast.

The perfection of the radio now suggests the idea of broadcasting this volume of: weird, whistling music, which has a tone all its own, to radio receivers as far as the waves will carry.

When the full chorus is on it sounds as if a whole city of people were playing piccolos in concert. The radio fan who is lucky enough to listen in will not have a bit of trouble in recognizing the marmot voices, even though no preliminary announcement is made from the broadcasting station.

Choice of Two Broadcasting Stations

A CHOICE of "listening in" to either of two of the big broadcasting stations will be a feature of a radio system to be installed in a seventy-two-family apartment-house in Newark, New Jersey. Two complete receiving sets will be installed, each with a large loop or directional antenna, so that each may be pointed to a particular broadcasting station and receive the programs without interference.

Each of the two aerials will be connected directly to a G-E receiving set, equipped with detector tube and two steps of audio and two steps of radio frequency. These sets will be located in a special radio room in charge of a licensed operator. From this room will emanate two complete circuits to each of the seventy-two apartments so that the tenant may plug in his receiving set to whichever of two programs he prefers. The apartment operator will tune in each evening to the two stations that offer the best programs.

MAGNAVOX

Radio

The Reproducer
Supreme

An essential
part of every
receiving set

BEFORE you pack up your receiving set for that vacation in the woods or on the water, be sure to equip it with a Magnavox Radio, the reproducer supreme.

R-3
Magnavox Radio
with 14-inch horn

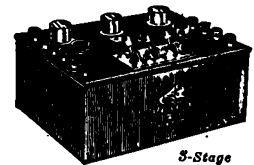
SAME in principle and construction throughout as Type R-2, and is ideal for use in homes, offices, amateur stations, etc.

Price; \$45.00

R-2
'Magnavox Radio'
with 18-inch horn

THIS instrument is intended for those who wish the utmost in amplifying power; for large audiences, dance halls, etc., but requires only .6 of an ampere for the field.

Price \$85.00



5-Stage

Magnavox
Power Amplifier
Model C

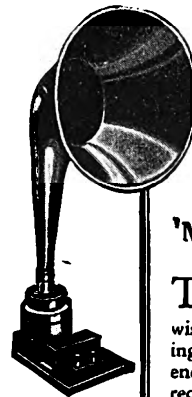
INSURES getting the largest possible power input for the Magnavox Radio. Can be used with any "B" battery voltage which the power tube may require for best amplification.

AC-2-C, 2 Stage \$80.00
AC-3-C, 3 Stage 110.00

Any radio dealer will demonstrate for you, or write to us for descriptive booklet and name of nearest dealer.

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5,000 Amateur and other owners radio apparatus	10.00
25,000 Amateur and other owners radio apparatus	40.00
50,000 Amateur and other owners radio apparatus	75.00
Amateur Radio Directory of the U. S. Complete list of Amateur stations with names and addresses of operators or owners. Priced for \$2.00. Names and addresses are guaranteed 98% correct will refund postage on all mail returned as undeliverable if less than 98%. Remit with order.	

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No. of Plates	M.F.D. Capacity	Assembled	Knocked-down
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11	.00025	\$2.50	\$2.00
21	.0005	\$3.25	\$2.50
43	.001	\$3.90	\$2.90

Lott's Better Radio Condenser Co.
473 ORANGE STREET NEWARK, N. J.

Offsetting Static Disturbance

How the Nine-Mile Aerial at Riverhead, Long Island, N. Y., Receives Five European Stations Daily Without Interference

By an Engineer of the Radio Corporation of America

IF we look upon the new antenna as a large lake and the wind as the static, we can get an idea of how it works. Now, suppose the wind is blowing across the lake from east to west. At the eastern end there will be little or no ripples, but as we get to the western end the ripples will gradually increase in size to full waves. If the shore at the western end is a gentle slope of sandy gravel, the waves will be dissipated and will not be reflected.

If, on the other hand, the shore of the lake is precipitous and rocky, the waves will be reflected and will disturb the eastern end of the lake. Now, this antenna, having a non-inductive resistance at its non-receiving end, corresponds to a sandy shore, because it absorbs the static and interfering waves and does not reflect them.

Carrying the analogy further, if we

place a stationary paddle wheel at the western end of the lake which is revolving uniformly and producing waves of a uniform character, these waves will travel steadily forward toward the eastern end and will not be interrupted by or stopped by the wind. This paddle wheel corresponds with the transmitting station and the waves it sends out are equivalent to the waves from the European station.

The tests which have been conducted at Riverhead completely confirm this theory. When the receiving apparatus is placed at the end which is grounded through the non-inductive resistance it is impossible to hear anything but a terrific roar due to continuous static discharge. Using the wire properly as wave antenna, transatlantic wireless communication can be carried on without any difficulty despite the static.

When the Real Radio Sport Begins

MANY of the people who have lately entered the radio game as broadcast enthusiasts will catch the real radio fever and eventually become confirmed "hams." They will learn the code, and will be able to understand the "dit, dit, da-a-s" of the hundreds of amateur and commercial code stations. Instead of condemning those fellows that at present spoil their broadcasting reception they will be their hearty supporters, says "The Globe," New York. After proficiency in the code is obtained these people will get an operator's and a station license, and install a transmitting set. The real sport of radio will be-

gin. Listening to radio concerts will then be a thing of the past—the goal now being to make new transmitting records, and break the old ones.

When you reach the stage of the game when your ambition is to break out into the ether, you fully deserve the title of "ham" or "bug." In this state you will think, eat, and dream radio. Money will flow out of your pockets like a stream of water. You will also join the league of "boiled owls," the fellows who crawl into bed when the dawn is breaking or sometimes not at all.

If you think the amateurs are busy spoiling people's concert receptions during the evening, just you listen in at some wee hour of the morning and you will hear the greatest conglomeration of sparks and C W that you ever heard in your life. The dark and still night exists no longer, but is being continually blasted by these ether hounds.

General Electric's Employees Receive \$1,011,568 in Bonuses

The General Electric Company announced today that it has paid \$1,011,568 to employees of its plants who have been in the company's service five years or more. The sum represents 5 per cent. of the earnings of the employees for the six months ended June 30.

Pictures and Facts About Armstrong Amplifier

Radio World has published a number of pictures, diagrams and descriptive articles regarding the New Armstrong Super-Regenerative Amplifier. The numbers containing this material are dated June 24, July 8, July 15, and August 5. They will be sent postpaid on receipt of 15 cents each, the four copies complete for 60 cents. Or you can subscribe, \$6.00 year; \$3.00, six months; and have your subscription start with the number dated June 24. RADIO WORLD CO., 1493 Broadway, New York.

If you did not get copies of Radio World, No. 1 to No. 21 send us \$3.00 or we will send you this paper for one year, (\$6.00 for 52 issues) and start it with our first issue, which will be mailed you as soon as possible after receipt of order.

SPECIAL INTRODUCTORY

BARGAIN

DICTOGRAPH HEADSET \$9.00

3000 ohms \$12 value

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CENTRAL-KANSAS
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RADIO WORLD

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Receipt by new subscribers of the first copy of
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subscription order.

Advertising rates on request.

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IMPORTANT NOTICE:

While every possible care is taken to state
correctly matters of fact and opinion in technical
and general writings covering the radio field, and
every line printed is gone over with a scrupulous
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out of technical problems, or other matters that
may be printed in good faith and on information
furnished by those supposed to be trustworthy.
This statement is made in good faith and to save
time and controversy in matters over which the
publisher cannot possibly have control.

Easy Way to Learn Code

AFTER the characters of the code have
been memorized, some sort of practice
set should be made or purchased, so that
actual transmission and reception can be
carried on. This is most easily and cheaply
accomplished by a buzzer outfit, the connec-
tions of which are shown in the drawing,
says a writer in "The Globe," New York.

All that is required is a transmitting key,
a buzzer and one or two dry cells. The key
can be of the ordinary telegraph type, but
if you later wish to have a real transmitting
station it might be better to get a regular
radio key with contact points of a size
sufficient to carry the current that you may
later use. The buzzer should be what is
known as the high-frequency type, as such
buzzers give a note or tone that more nearly
resembles radio signals.

When the parts are connected, you may
begin practice. Adjust the spring regulator
on the key and also the back screw, for the
proper tension and spacing of contacts. This
proper adjustment varies for different in-
dividuals. Some like a heavy tension and
close spacing, while others like a light ten-
sion and wide spacing. For a beginner, a
medium tension with medium spacing is best.

Grasp the knob of the key lightly with the
thumb and first two fingers—the thumb
being under the edge of the knob, and the
two fingers on top. Although the knob
should be held lightly, it should be pressed
firmly when making the dots and dashes.

To make a dot, press the key down for a
very short interval, or at first make it a
whole second. To make a dash, press the
key down for a period about three times as
long as that for a dot, or in this case three
seconds. After you have learned to make
and distinguish between the dots and dashes,
you can proceed with simple words, making
them very slowly at first, and afterward in-
creasing this speed as your facility increases.

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back numbers of RADIO WORLD to date (17 in
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Or subscribe at \$6.00 a year, \$3.00 six months, and
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and is the only recti-
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following essential
Homcharging features:

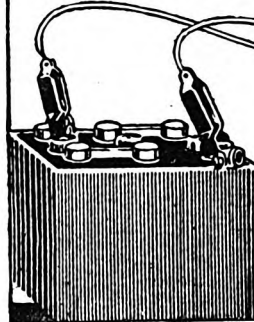
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placeable as a unit, after thousands of hours' use, at small cost. Cannot be injured by rough handling.
3. Operation stops and consumption of current ceases immediately upon disconnecting battery.
4. The only charger costing less than \$100.00 that will fully charge a battery over night. Gives
battery a taper charge—exactly as recommended by battery manufacturers. Guaranteed not to harm
your battery, even though left connected indefinitely.
5. Highest efficiency of any three or six cell charger made.
6. No danger of fire. Approved by the Underwriters.

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Will charge your auto battery as well as radio battery.
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For sale by all radio, electrical and accessory
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\$20 West of the Rockies

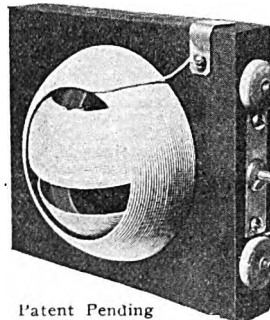


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tric losses; nickel plated brass bearings. A three-inch
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RADIOMART variometers are best for 3 circuit and
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They are the neatest and best shaped variometers made
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21 copies will be mailed postpaid on receipt of \$3.00; or better still,
subscribe now for nine months (\$4.00), or twelve months (\$6.00 for 52
issues) and have your subscription start with No. 1. Radio World Co.,
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Manufacturers, send a sample of your goods to our Technical Editor, Fred. Cahrls Ehlert, 9006 Pleasant Street, Queens, Long Island, N. Y. It will be carefully tested and returned. If your goods satisfy our experts, RADIO WORLD'S endorsement will be published in our merchandise department without charge or obligation of any kind on your part. This is a free service on the part of RADIO WORLD, calling for no expense whatsoever on the part of the manufacturer, except the sending of a sample of his goods. We are doing this for the benefit of the radio trade in general.

Goodman Three Coil and Mounting

(L. W. Goodman, 10 Forrest Ave., Drexel Hill, Pennsylvania)

THE Goodman 3-coil inductance unit with mounting was tested out in various circuits. The coils are neatly made, having a bakelite frame upon which is wound enameled copper-wire. Due to its peculiar winding, its effective distributed capacity loss, which, in turn, makes the coils and mount, is so arranged that contact is permanent, with the market advantage of shifting coils in a moment's notice. All parts are nicely nickle-plated and of neat appearance and well constructed. In the circuit the coils functioned best. Better results were obtained than with a set employing variometers. Due to the close proximity of high-powered stations, the coils averaged, approximately, from 150 to 580 meters, while the 600-meter stations could be heard, as if working with an expensive receiver. With the proper condensers, they make up a nifty short-wave regenerative receiver.

Allied Radio Panel-Board

(Allied Radio Corporation, 444 Seventh Ave., New York City, N. Y.)

A PIECE of Allied radio-panel was tested and found to stand up under a strain of 75,000 ohms resistance. It is manufactured

from a composition of hard rubber, with highly polished surfaces. Drilling becomes an easy task, avoiding all burrs, and comes ready to be cut for panel-board use. Comes in three sizes: 7x10x3/16 inches, 7x18x3/16 inches, and 12x14x3/16 inches.

Galena Stands Test

(Charles L. Cassidy, Marion, Kentucky)

TWO pieces of Galena (crystal) were tested in various circuits. The crystal was found to be uniform over the entire surface, with extra sensitivity. Signals were loud, clear, and distinct. The material was good.

Variometer Stands Test

Star Radio Mfg. Co., 122 Fifth Ave., New York City, N. Y.

A VARIOMETER of neat construction. Tested in two circuits. When placed in the aerial circuit of an oscillating receiver, it was found to respond to a wave-length range of approximately from 150 to 500 meters. When connected into the plate circuit of a regenerative receiver, it oscillated over the entire scale of wave lengths: 150 to 450 meters. The rotor is mounted carefully on a 1/4-inch brass rod, between springs which keep it in proper position. Fahnestock clips are used for the connections. Construction and appearance are very neat. These variometers are ready for panel mounting.

Coming Events

The editors of RADIO WORLD will gladly publish news items of all contemplated radio shows and exhibitions. Keep us posted by mailing full information.

ANNUAL SHOW OF THE ST. LOUIS RADIO ASSOCIATION, St. Louis, Mo., October 4 to 7, inclusive.

CHICAGO RADIO SHOW, Coliseum, Chicago, Ill., October 4 to 22. U. J. Hermann, managing director, 549 McCormick Building.

INTERNATIONAL RADIO EXPOSITION, Grand Central Palace, New York, December 21 to 30.

KANSAS RADIO EXPOSITION will be held at the Kansas State Fair, Hutchinson, Kansas, September 16 to 22, inclusive. A. L. Sponsler, secretary.

"RADIO DAY," Pittsburgh, Westview Park, August 24. Under auspices of Radio Engineering Society. C. E. Urban, secretary.

RADIO CLUB OF AMERICA. First autumn meeting will be held the last Friday in September. Renville H. McCann, secretary. Columbia University, New York.

CLEVELAND RADIO AND ELECTRICAL EXPOSITION, Cleveland Public Auditorium, Cleveland, O., August 26 to September 4, inclusive.

CINCINNATI RADIO-AND-ELECTRICAL EXPOSITION, Music Hall, Cincinnati, O., October 7 to 14, inclusive.

NEW YORK ELECTRICAL AND INDUSTRIAL EXPOSITION, Grand Central Palace, New York City, October 7 to 14, inclusive.

NEWARK'S SECOND ANNUAL RADIO SHOW, Robert Treat Hotel, Newark, N. J., October 4, 5, 6 and 7.

SECOND NATIONAL RADIO EXPOSITION, direction International Trade Exposition Co., Chicago, January 13 to 20, inc., 1923, George A. King, director of publicity, 417 South Dearborn Street, Chicago, Ill.

World Trade-News to Be Sent by Radio

SINCE the recent decision of the Department of Commerce to have foreign commercial data broadcast from radio stations in the neighborhood of its thirty four district offices, schemes for the improvement of this service, particularly in the saving of time, have been received from several sources. One of the recent suggestions is that radio receiving-sets be installed in all the branch offices of the department so that commercial data broadcast from Government stations in Washington and other important centers may be received without delay and rebroadcast locally. The plan is now being considered by the Bureau of Foreign and Domestic

New Firms and Corporations

Notices in this department are considered as purely interesting trade news and published without compensation to us. We welcome trade news of this nature. All notices having an advertising angle are referred to our Advertising Department, and are placed under Classified Advertising at 5 cents a word, or as Display Advertising at \$5 an inch.

(The firms and corporations mentioned in these columns can be reached by communicating with the attorneys, whose addresses are given whenever possible.)

Cleartone Radio Co., Cincinnati, O.
Radio Parlor, 2071 Broadway, New York, N. Y.

Comal Radio Laboratory, 702 San Antonio St., New Braunfels, Texas.
North American Radio Corporation, 2333

Sherbrook St., Pittsburgh, Pa.

United Radio Co., Columbus, O.
Holland Briggs and Maurice Purdy, Radio

supplies, Howell, Michigan.

The Globe Radio Company, K. V. Tadlock, Phoenix, Arizona.

Midwest Radio Central, Inc., 50 East Van Buren St., Chicago, Ill.

East Radio Company, Belfast, Maine.
Phoenix Radio & Parts Co., 119 West 4th St., Cincinnati, O.

The Hub City Cycle Co., Centralia, Wash., has added a line of radio supplies to its sporting goods business.

Charles Freshman Company, Inc., 290 Hudson St., New York City. Manufacturers of Micron Fixed Condensers and Antenna.

Perfection Radio Corporation of America, Manhattan, \$20,000; A. G. Solomon, R. Graubard, M. Blauk. (Attorney, L. H. Solomon, 200 Fifth Av., N. Y.).

Eastern Radio Corporation, Manhattan, \$75,000; S. M. Knapp, I. Demaree, J. J. Stankiewicz. (Attorneys, Reit & Kaminsky, 35 Broadway, N. Y.).

Radio-Tone Chemical Company, Manhattan, \$100,000; E. G. Coundjeris, R. G. Mangauaris, E. G. Manias. (Attorney, L. Blecker, 249 West 34th St., N. Y.).

Vulcan Radio & Electric Corporation, Manhattan, \$100,000; P. R. Bassett, C. S. Ashley, T. O. Hall. (Attorneys, Ashley & Foulds, 156 Broadway, N. Y.).

Autler Electric Co., Manhattan, sell current and appliances, \$30,000; L. and A. and B. Autler. (Attorney, B. B. Greller, 289 Broadway, N. Y.).

Radio Chain Stores Co., Trenton, supplies, \$125,000; Leon Abrams; Abraham Young, New York; Maurice Abrams, Newark, N. J.

National Radio Products Co., New York. Radio apparatus, \$100,000. (N. S. Corp. Co.)

Continental Electric Co., Newark, manufacture machinery, \$100,000; Mauritz Larsen, North Arlington; Eric H. Anderson, Wallford A. Peterson, Belleville; John Anensen, Arlington, N. J.

Radio Static Tube Mfg. Co., Rochester, N. Y., has increased its capital from \$10,000 to \$100,000.

Commerce, and if a favorable report is made, the department may be in the market for thirty-four A-L receiving sets. It is readily admitted by officials that much time would be saved in relaying the information from the Washington headquarters and getting a wide broadcast for the whole country, but fears are entertained that an appropriation for purchasing the receiving sets might not meet with the approval of an economically inclined Congress.

A great mass of foreign trade-information is received by the department daily.

Fraudulent Radio Stock-Jobbing Attacked

Better Business Bureau Issues Warning to Public and Manufacturers, After Invest- igation Following Many Complaints

Radio Development in Strong Hands

THE prediction made recently in the press that the radio industry would soon attract flocks of fake promoters and financial parasites has come true, according to the findings of the Better Business Bureau of New York City. This organization had been in operation for only a few days when it began to receive complaints against alleged wild-cat radio companies that were hawking their securities throughout the city, fleecing small investors out of their savings by high-pressure stock-selling methods, utterly false representations and ridiculous promises of fabulous future earnings.

The bureau has just made public a report of the investigation of what it terms one of the most reprehensible of these blue-sky, mushroom companies, organized a few months ago with an authorized capital of \$4,000,000, the par value of the stock being \$1. The sales organization of the company has been active in hawking stock and has already taken in many thousands of dollars from small investors, so the bureau reports.

According to H. J. Kenner, manager of the Better Business Bureau, radio get-rich-quick schemers are running true to form. They organize their corporations on a shoe-string and induce the public to finance their ventures and pay for manufacturing or distributing experiments. Having launched their stock-sales campaigns, the wild-cats take care of themselves first, by fat salaries for services, which consist principally in selling to the public more stock through wild promises followed by little or no performance. The cost of promotion is prohibitive, forty to ninety per cent of the money paid for stock going to the sales organization.

"Their cupidity stirred by the popularity of radio, professional promoters—and others—are attempting to broadcast among wage earners and other uninformed investors millions of shares of stock in enterprises alleged to be formed for the purpose of manufacturing and distributing radio apparatus for amateur uses," says the special report of the Better Business Bureau, in discussing the first get-rich-quick radio scheme it has investigated. Right at the beginning of its investigation the bureau recognized, in the leading spirit of this particular outfit, a professional promoter whose methods in promoting a motor-stock last year called for action by the National Vigilance Committee of the Associated Advertising Clubs of the World.

"In line with the usual practice of vendors of blue-sky securities, this radio stock was recently advanced in price from \$1 (par value) to \$1.50," says the bulletin, which quotes an official of the company as saying that this boost was justified as the company had been making big profits all the time, 300 per cent being the average made on most of the products turned out.

But the trouble with the 300 per cent profit, the bureau found, was that it existed mostly on paper. The company was producing so little that its profits from merchandise sales were almost negligible. Nevertheless, an executive of the company stated

that because of enormous profits, shares would be selling for \$4 each, before the snow flies.

But, according to the Better Business Bureau Bulletin, the leading promoter of the company admitted, under cross-examination, that his concern would be insolvent if he did not feed it money constantly from stock sales. Another official of the company admitted early this month that his company was insolvent; that it had not operated at a profit and that the unfilled orders, which stock salesmen said were piled up in the offices of the company, amounted to only a few thousand dollars.

During the past few months, the bulletin states, the radio company in question has been flooding the United States mails with stock-selling literature of the wild-cat variety. Thus, the officers, members of the board of directors and others connected with the company were described in glowing terms as world leaders in their line who had forged their way to the top in this new industry.

One of the directors is described as the former financial advisor of one of the most famous banking houses of the world, who had been the associate of J. P. Morgan, Cornelius M. Bliss, Jr., Governor Benjamin Strong, Jr., J. D. Rockefeller, Jr., the late Henry P. Davison, Herbert Hoover, and others.

The bulletin states that the director in question promptly denied that he had ever achieved these financial honors and then severed his connection with the radio company. It states also that the promoters claimed a vice-president of one of the best known and most reliable banking houses of New York City had joined their Board of Directors, but that this also proved false.

"In order to impress prospective stockholders with the flourishing condition of the corporation," the bulletin continues, "Salesmen said that enormous profits were being made, that forty to fifty men were at work in the factory leased by the company in New Jersey, and that its products had been bought by the De Forest Company and by Butler Brothers' mail-order house.

"Investigation showed these statements to be false. According to an official of the

company, not more than twelve people, mechanical and clerical, were employed in the company's so-called plant at Newark, at the time these statements were being made to credulous prospects. Officers of the prominent companies named as customers deny that they have purchased goods of this radio products company."

Another advertising claim stated that the output of four factories had been taken over by this flourishing radio concern, but according to the Better Business Bureau bulletin, "This representation narrows down to the fact that contracts have been made with two small factories to take their products at prices which a consulting engineer of the company has admitted to be 'high.'"

The Better Business Bureau found further that an invention exploited eloquently by the radio company as one that would revolutionize the industry had not been patented, so claimed by the company, but that applications for patents were merely pending, and that the control of the patent was the subject of a court dispute between the radio company and the inventor.

The Better Business Bureau is not a profit-making organization. It is a membership association which will be supported by representative firms in this business community. It will have no clients except the public and legitimate business at large. Its aims are constructive and its efforts will be dedicated to service to the public. It will seek to increase public confidence in business while fighting fraud in financial and merchandise advertising and selling practice. It will not attempt to advise investors. By handling specific cases involving the selling of questionable securities, it will give definite help to the 'Before you Invest, Investigate' campaign in which legitimate business is participating throughout the country. Its activity will be continuous, not sporadic.

The board of directors of the bureau are: D. F. Houston, president, Bell Telephone Securities Company, Inc. president; R. T. Halsey, Tefft, Halsey & Company; Lewis E. Pierson, chairman of the board, Irving National Bank; John J. Pulleyn, president, Emigrant Industrial Savings Bank; Gates W. McGarrah, chairman of the board, Mechanics and Metals National Bank; George W. Hodges, Remick, Hodges & Company; H. S. Houston, chairman, Board of Vigilance Trustees, Associated Advertising Clubs; J. G. White, president, J. G. White & Company; William H. Barr, president, National Founders' Association; H. D. Robbins, chairman National Vigilance Committee, Associated Advertising Clubs; Russell R. Whitman, publisher, "New York Commercial."

The Armstrong Super-Regenerative Circuit

The Only Authentic Book Published.

At your dealers, or direct if he cannot supply you. Mailed on receipt of one dollar.

KING RADIO CORPORATION, Dept. F.
122 Fifth Avenue New York City



Hard Rubber Composition PANELS

Conform to Navy Specifications

A High Resistance Panel, Guaranteed Not to Warp, and Drilled Cleanly Without a Burr. Highly Polished—Edges Ground to Size.

Standard sizes, 7x16x3/16, 7x18x3/16, 7x24x3/16, 10x12x3/16, and 12x14x3/16, in stock for immediate delivery. Orders for special sizes received in the morning, shipped the afternoon of the same day. Binding posts, dials, and knobs to match. We have a complete line of Coils, Variometers, Variocouplers, Sockets and Rheostats.

Largest Discounts.

Jobbers and Dealers! Write for proposition and Free Sample!

CAREFUL ATTENTION GIVEN
TO ALL RADIO ENTHUSIASTS

ALLIED RADIO COMPANY, INC.

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WANTED—A Reliable New England Representative.

PATENT
Your Radio Ideas.
Call or Write
FREE ADVICE

ASK MANUFACTURERS
PATENT CO.
FOR 520 FIFTH AVE
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AGENTS

Wanted in every city and town to sell radio apparatus. Good commissions. A few stocking agencies open to reliable parties.

DELANCEY, FELCH & COMPANY
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Learn to Receive Code Messages Standard Regulation U. S. Army Field Message Book

Purchased from Signal Corps, U. S. A.
Pocket Size: 4"x6", Cloth Bound, Hard
Board Cover, 104 Pages.

CONTAINING:

MORSE CODE SEMAPHORE CODE
INTERNATIONAL CODE

Carbons and Blanks for receiving, etc.

MAILED
POSTPAID 20c.

ACORN TRADING CO., Inc.
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No Aerial No Loop
No Lamp Socket Attachment

ONLY—

RADIO-DUCT

—AND A GROUND CONNECTION

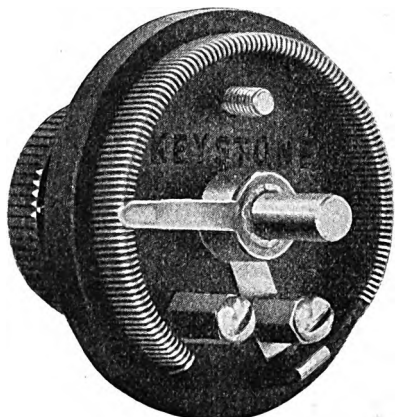
Sold in 10-Foot Rolls
At \$1.00 per Roll

IF YOUR DEALER HAS NOT
GOT IT WE WILL SHIP
DIRECT UPON RECEIPT OF
YOUR REMITTANCE.

Columbia Electric Motor Co.

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HOBOKEN NEW JERSEY
Telephone: 3731 Hoboken

KEYSTONE FILAMENT RHEOSTAT



RESISTANCE 6 OHMS.
CARRYING CAP., 1½ AMPS.
LIST PRICE, \$1.00

DEALERS AND JOBBERS
Wire or Write for Discounts.
Immediate Delivery

Manufactured by
Keystone Radio Company
Dept. W. GREENVILLE, PENN.

The Radio "Colyum"

FRENCH scientist claims to have invented a device which will send perfume by radio. Fellow in New York can buy nickel's worth of sniff water at five-and-ten-cent counter and spray his best girl out in Chicago.

"Since Mame and that beau o' hers get chewin' the rag on a long wave, every night, there's no gettin' the dishes done," wailed Mrs. McGinnis to her neighbor.

Some of our New York telephone operators say they won't care if radio does supplant the telephone, because there can be no harm then listening in.

Conan Doyle's latest message from a departed spirit read: "It's so lonesome up here, I wish I had brought my radio set."

Radio is improving. The day will soon come when the wife who induces her husband to stay home and hear a fine concert won't have to explain why a market report tuned in instead.

*Carry me back to Old Virgin-gin-ginny;
back where the corn and the sweet
potatoes grow,
An' I'll be satisfied with my gin-gin-ginny,
as I sit all day by my rad-i-o-o-o-oh!
Latest Barbershop Harmony.*

TO ANXIOUS READER: If there are no bedsprings in your apartment, use the fire escape for an aerial.

Margie—And he had radio eyes!
Sue—What do you mean, radio eyes?
Margie—Oh, just eyes with a broad cast!—C. H. Dillinger, in "Radio Journal."

No, Rollo, the author of "What Are the Wild Waves Saying?" was not the first radio bug.

It is said that "B. y. o. h." soon will take the place of "R. s. v. p. on soiree invitations. It means "Bring your own headpiece."

Have you heard the latest radio ballad: "Home Is Where the Hook-up Is?" And he wondered why "The Blue Danube Waltz" didn't sound just right. He was using a two-step amplifier.

Our Own Broadcasting Station

OUCH for week beginning August 28, 1922
7:00—Dumbwaiter Tales or Listening In While the Ice Man Makes His Morning Rounds.

7:23—Didymous debate: "Why Do Twins Dress Alike?"

7:42—Arithmetic Lesson for Restaurant check adders.

8:01—Foolish question No. 822,743: "Why did one hundred American passengers on a British liner drink \$10,000 worth of champagne while crossing the Atlantic?" Answer will be furnished by the Anti-Saloon League.

8:17—Study in Futuristic Art: "Man Trying to Send Alimony by Radio."

8:46—That Subway Lullaby:
"Never invite me to dinner if you're going to serve sardines; I pity them poor little fishes; I would rather have water and beans."

9:00—"Bathing Suits I haven't Been Able to See This Season," by a One-Eyed Censor.

9:30—First sad thought of winter: "How Can I Separate Last Year's Overcoat From It's Moth Ball."

10:00—Correct time from the Three-Mile Limit.

ROBERT MACKAY.

The Nelson Radio Parts Co.

Manufacturers and Distributors of

RADIO APPARATUS

Write for Catalog.

59 ACADEMY STREET, NEWARK, N. J.
Tel. Market 4066

RADIO MAILING LISTS

6900 RETAIL RADIO DEALERS covering the United States, by states, price per thousand\$7.50
888 Radio Manufacturers, per list.....10.00
1022 Radio Supply Jobbers, per list.....10.00
260 Owners of Radio Stations, per list.....4.00
14000 Radio Amateurs and Managers of Radio Stations, per M 7.50
These are neatly typewritten and ready to send on receipt of remittance covering the amount. Guaranteed 98% correct.
TRADE CIRCULAR ADDRESSING CO.
166 W. ADAMS STREET CHICAGO, ILL.

READ RADIO BOOKS

By JAMES R. CAMERON

HOW TO BUILD YOUR OWN RADIO SET \$.25
RADIO DIRECTORY..... .50
RADIO FOR BEGINNERS 1.00

Buy them to-day from your dealer or direct from

TECHNICAL BOOK COMPANY
130 WEST 42nd STREET NEW YORK

Our Free Catalogue

Is Yours For the Asking—It Tells All About Our Wonder Sets, Vacuum Tube and Loose Coupler, also

Little Wonder Crystal Set

A Practical Receiving Set Within Reach of Everybody's Purse.

\$2.50 Unmounted Mounted, \$4.00

Radi-O-Plate Panels to Order.
All sizes cut as specified.

Holloway Electric Supply Co.
238 THIRD AVE. NEW YORK
Phone Gramercy 5628

The GOODMAN

Is the Niftiest Short Wave
Tuner on the Market

Only \$6.00 & PP on 1 lb.

Send for pamphlet.

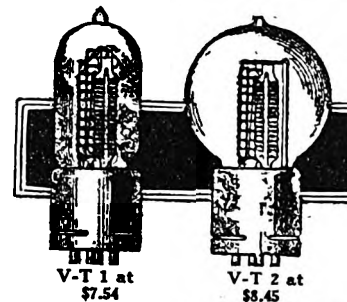
Order through your dealer.

L. W. GOODMAN

Manufacturer

DREXEL HILL, PA.

Dr. Miller, of Chicago, writes: "My perfectly good variometers and vario-coupler now go into the discard."



These are the Tubes for which so many are inquiring and that are still difficult to find anywhere. There being very few of these tubes on the market, and after present supply is exhausted, more will not be available at any price, as they are to be made exclusively for the U. S. government, sure long life.

FULL LINE OF SUPPLIES. LOWEST PRICES ON STANDARD MERCHANDISE. GET OUR PRICES BEFORE PLACING YOUR ORDERS.

Amalgamated Radio Supply Co.
EXPORT AND IMPORT

193-A William Street New York City

GOING—and Going Fast

We have only a few left and they are going fast, but while they last we will continue to sell them at the reduced price.

VT 1 Detector and Amplifier.....\$7.50

VT 2 Detector and Amplifier.....\$8.00

The above tubes are the genuine army J's and E's, respectively.

"RADIO BUILDER" PLANS FREE!

By Mail, 5c.

LIBERTY RADIO CO.

106 Liberty Street New York City

BUY "RITE"

\$5.00 Variometer	\$3.20
\$5.00 Variocoupler	3.20
Firth S. C. Jack .....	.55
Rite Rheostat .....	.75
Kloster Rheostat	1.00
Rite Detector Units	5.50
Rite Amplifier Units	11.95
1250 Henaycomb Coil	3.30
1500 Henaycomb Coil	3.80

CRYSTAL RECEIVER complete—Aerial, Lightning Arrestor—Phone, ready to operate

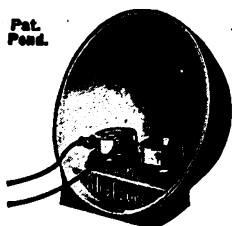
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"RITE" RADIO SHOP

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Sterling 8513

**DIFFERENT**

and better than others. No tubing or horn to distort delicate notes. Swells every sound into full richness!

Low in Price!
High in Quality!

\$5.00 AT ALL GOOD DEALERS
OR DIRECT BY MAIL

WITHOUT RECEIVERS

SHELTONE
LOUD SPEAKER

THE SHELTONE COMPANY

29 Clinton Street

Newark, N. J.

Latest Foreign Radio News

THE British annual Colonial report for Gambia mentions the completion of wireless telegraph and telephone stations in that colony at Bathurst and at McCarthy Island, 176 miles distant. These stations are intended for internal communication, as the colony has no organized telegraphic wire system.

Work is in progress on the first large radio-station for international traffic in Belgium. Up to the present time, the Belgian wireless service has been limited to reception from the high-power stations of other countries and distribution to points in Europe via land wire. The fact that the circuit was available only to traffic in one direction has prevented the development of the service. The completion of this new station at Bruges will make it possible to handle a considerable volume of the foreign communications of Belgium by radio.

The Eiffel Tower radio station, Paris, is preparing to send out telegraphic weather reports and forecasts three times daily. A suggestion has been made that radio receiving sets be installed at central points in the various country communes and that the information thus received be signaled to the farmers by a code of sound signals from the church bells. For example, no signal if no change in the weather is forecast; three strokes of the bell if rain is expected; six strokes for frost, and ten strokes for wind or hail storms.

Consul Wesley Frost, Marseilles, states that owing to governmental restrictions, the development of radio amateur clubs in France has been so retarded that few are in existence outside of Paris. The Radio Club of France has recently established its first branch office at Marseilles, and its local representative has opened offices at 44 Rue des Abeilles and in the grounds of the French National Colonial Exposition. The program of the club provides for lectures, exhibitions, and advice to amateur radio operators and to commercial operators as well, the idea being to foster the development of the radio art.



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Handle Our Standard Radio Goods.

**OUR TRADE PRICES
AFFORD GOOD MARGIN.**

Write for catalogue and price list.

**WIENER WIRELESS
SPECIALTY COMPANY**

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**GITHENS TRUTONE RADIO
HORN—LOUD SPEAKER**

First one to sell
on ten day trial
Money back
Guarantee

Retail Price

\$21.00

Includes

Loud Speaker

Trutone has been pronounced the best on the market by experts. It has a clear true tone. Every radio fan should try Trutone and compare it with others. If YOU don't find Trutone the best, your money will be refunded. It is sold on a ten-day trial money-back guarantee. If not carried by your dealer write us.

Distributors and Dealers, write!

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1815 Trombly Ave., Detroit, Mich.

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BRASS, BRONZE, ALUMINUM

Our Motto
"SERVICE"

THE ANCHOR BRASS & ALUMINUM CO.

Ninth and Freeman Sts.

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DO YOU WANT TO BUY, SELL OR EXCHANGE RADIO OR OTHER GOODS? TRY THIS
DEPARTMENT AT 5c A WORD

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This department is intended for everybody who wants quick action on short announcements covering the buying, selling, exchanging or general merchandising in the radio field. Readers of RADIO WORLD will find that it pays to read these columns every week. Advertisers will get a ten-day service here—that is, copy received for this department will appear in RADIO WORLD on the news-stands ten days after copy reaches us.

The rate for this RADIO WORLD QUICK-ACTION CLASSIFIED AD. DEPT. is 5c. per word (minimum of 10 words, including address), 10% discount for 4 consecutive insertions, 15% for 13 consecutive insertions (3 months). Changes will be made in standing classified ads., if copy is received at this office ten days before publication. RADIO WORLD CO., 1493 Broadway, N. Y. C. (Phone, Bryant 4796.)

Manufacturers of Rogers Radio Receivers and Rogers Receiving Radiometers. Rogers Radio Company, 5133 Woodworth Street, Pittsburgh, Pa.

High Grade Antenna Wire. Best quality 7 strand No. 22, tinned copper, non-corrosive antenna wire. Only 1c. per foot. The Kehler Radio Laboratories, Dept. W., Abilene, Kans.

TO THE TRADE—Fixed Phone and Grid Condensers. Write for price list and sample. SALKEY RADIO CO., 2378 Eighth Ave., New York City.

PATENTS—Electrical cases a specialty. Pre-war charges. B. P. Fishburne, Registered Patent Lawyer, 386 McGill Bldg., Washington, D. C.

Exchange jolly interesting letters through our Club! Stamp appreciated. Betty Lee, 4254 Broadway, New York City.

BOYS—Write for our offer whereby you can secure a complete Audion Bulb Outfit and Amplifier FREE. LEE RADIO CORPORATION. Haddonfield, N. J.

THE AUTOVOIX LOUD SPEAKER
The clearest and best loud speaker on the market for the money. As good as the higher priced instruments. Price, \$22.50 delivered. Thousands now in use. Send money order, cash or check to PAUL ENGSTRUM, 630 Southern Building, Washington, D. C.

ACMEPHONE RECEIVER Detector, two-stage, three bulbs and B Batteries. Loud speaker. Price, \$80.00—express paid. John Exton, Adamsburg, Pa.

PATENTS

Protect your invention today. Write for 1922 Illustrated Book Free. Radio, Electrical, Chemical and Mechanical experts. Over 30 years' experience. A. M. Wilson, Inc., 310-18 Victor Building, Washington, D. C. (Successors to business established 1891 by A. M. Wilson.)

CRYSTAL DETECTOR SET, from aerial to phones, complete. Big bargain. Send for circular. Salkey Radio Co., 2378 Eighth Ave., New York City.

RADIO DRILL SET—Ten sizes especially adapted for hooking up instrument boards, making various sizes wire holes, etc. \$1.00 postpaid. BOX 326, Baltimore, Md.

MOUNTED CRYSTALS

Fifty cents in coin or stamps will bring you three selected crystals by return mail. Sensitiveness guaranteed or money refunded. Special prices in larger quantities. Thousands in use permit this unusual offer. Lynch & Co., 333 Warren St., Harrison, N. J.

YOUNG MAN, age 19, Graduate Electrician, and Radio "Bug," desires position with high-grade Radio Manufacturer or Distributor. Will accept anything at any wage to start, except commission selling. Write Route 2, Box 133, Portland, Tenn.

CASH FOR OLD GOLD, Platinum, Silver, Diamonds, Liberty Bonds, War, Thrift, Unused Postage Stamps, False Teeth, Magneto Points, Jobs, Any Valuables. Mail in today. Cash sent, return mail. Goods returned in ten days if you're not satisfied. OHIO SMELTING CO., 337 Hipodrome Bldg., Cleveland, Ohio.

STORAGE BATTERY BUILDING FOR AMATEURS, by R. H. McConnell and P. G. Sullivan. It tells you how to build that storage battery you have been wanting. Price 75c. postpaid. H. H. McConnell, Ravenna, Neb.

RADIO SUPPLIES—Murdock 56, 3000 ohm Receiver, \$5.25; Radiotron Amplifier UV201 tubes, \$5.50. Send for list of supplies, sets, etc., at reduced prices. All sent prepaid. Wesley Robinson, Jr., St. Marys, Ga.

TEN non-regenerative guaranteed receivers on formica panel, \$10.00 each. A. Piepkorn, 5610 Washington Blvd., Milwaukee, Wis.

For Sale—Complete two-inch spark set. Mesco Coil, condenser, pancake helix, gap, key. \$10.00. F. W. Frost, Prospect Ave., Princeton, N. J.

QST de 3AEO—Equip your sets with YRLS loading coils and get what you're missing. For crystal or tube sets. Range to 3000 meters. Price, \$4.00. The Yardley Radio Laboratory, Yardley, Pa.

"ARCO" MAGNET WIRES bring 'em in loud. Low prices. (See August Radio News). Quick deliveries. Free 10 per cent. premium coupon with orders over \$1.00. Send now 8c for complete bulletin, listing hundreds of parts and sets. AMERICAN RADIO CO., Box 133, Baltimore, Md.

FOR SALE—New and used tubes, and accessories of all kinds. Write for prices to W. C. HAIGH, 58 Newfield Street, East Orange, N. J.

Model STEAM ENGINE, bore 1½, stroke 2¼"; price \$20.00. Never has been used. Express prepaid. John Exton, Adamsburg, Pa.

**Radio May Yet Turn
Wheels of Industry**
(From an address by Dr. Charles P. Steinmetz, before the International Radio Congress, Chicago.)

THERE may be a time when power to turn the wheels of industry will be furnished by radio. In some respects radio power transmission exists today, for the message you receive by radio has been carried by the power of electromagnetic waves from the sending to the receiving station.

The problem of power transmission essentially differs from that of the transmission for communication in that in power transmission most, or at least a large part, of the power sent out by the generating station must arrive at the receiving station to make it economical to transmit the power.

Hence the problem of radio power transmission is that of directing the radio waves

so closely that a large part of their power remains together, so as to be picked up by the receiving station. Much successful work has been done in directing radio waves, and, for instance, our transatlantic stations send out most of their power eastward.

But still, even as directed, the power scatters over the coasts of Europe from Norway to Spain, so that it is impossible to pick up an appreciable part of it.

The second possibility of radio power transmission—at least theoretically—is by resonant vibration or standing waves.

A station tuned for the same wave length as the sending station would resonate with the standing electromagnetic wave, issuing from the sending station, thereby stopping its passage by absorbing its energy. It would, as we may say, punch a hole in the standing wave sheet coming from the sending station. Power would then flow into this hole; the sending station would begin to send out additional power to maintain the wave.

**Apparatus of the New
Radio Plant at Sainte
Assise, France**

THE transmitting station of the new French radio plant of the Centre Radio-electrique de Paris is situated on the plains of Sainte Assise, forty kilometers southeast of the French metropolis. The apparatus consists of two high frequency alternators of 500 kilowatts in the antenna, each driven by two direct current motors of 450 kilowatts. These groups can function together or separately, either affecting a single transmission with a power varying from 250 to 1,000 kilowatts in the antenna or affecting two simultaneous transmissions with power permitting each between 250 and 500 kilowatts in the antenna.

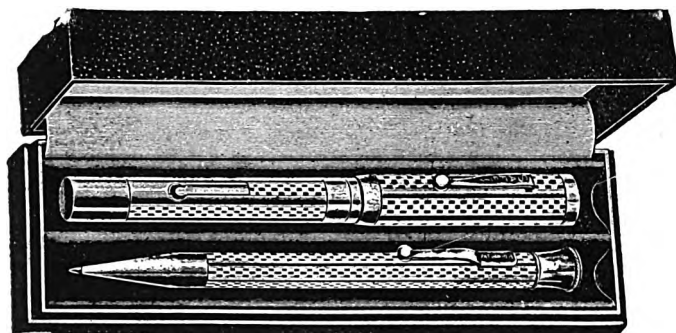
The receiving station has been erected at Villacresnes, half way between Paris and Sainte Assise. It consists of six receiving units supplied with the most up-to-date apparatus. Normally the messages are received directly at the Central Bureau, Paris, by means of special high-speed machinery.

The Central Bureau, the hub of control and coordination of the network of this vast organization, is located at 79 Boulevard Haussmann, in the center of Paris. It is connected by direct wires with the general telegraphic administration of the Government and also with Sainte Assise and Villacresnes.

"And what did the poor little dog do when you brutal boys tied the can to his tail?"

"Oh, he just went broadcastin' down the road."—Philadelphia Retail Ledger.

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as a Radio Reference**
52 Weeks for \$6.00
Complete Your File of RADIO WORLD
Copies of Radio World No. 1



Special Offer TO Radio World READERS

RUSH your name and address and we will tell you HOW you can get this handsome 14k. Gold Filled Fountain Pen and Pencil Set.

Absolutely Free

REMEMBER, with our plan it WON'T cost you a cent. The set comes to you in an elaborate plush box. Fill out the coupon herewith and mail at once for our FREE PLAN.

Publisher's Promotion Bureau, 120 Patchen Avenue, Brooklyn, N. Y.
Gentlemen: Without any obligation on my part, please send me particulars of the above offer.

Name
Street City

Stop, Look and Listen In!

Manufacturer, retiring from radio line, will dispose of stock of single, double and triple Sockets, Rheostats and Binding Posts, in either large or small lots, at a great sacrifice.

C. R. BAIRD COMPANY
243 East 151st Street, New York

FORMICA RADIO PANELS

3/16" thick, cut to size, per sq. in.\$0.02
VARIABLE CONDENSERS
48 plate, "Elite" condensers, Cap. .001 M. F. 4.00
VACUUM TUBES
U. V. 200 detector tubes 5.00
U. V. 201 Amplifier tubes 6.50
Brander "Superior" phones, best by test.... 8.00
HUGHES ENGINEERING CO.
P. O. Box 57 Terrace Park, Ohio

RADIO SUPPLIES

Complete Sets Made to Order.
Only standard made goods carried in stock.
HENRY C. SCHENKER
51 Greenwich Street New York City

LOMBARDI

Vernier Variable Condensers
Best on the Market. Fully Guaranteed.
All Sizes. Dealers Write!
THE PLYMOUTH ELECTRIC CO.
155 Court Street New Haven, Conn.

"If it's RADIO—We have it"

K. D. Varo-couplers\$1.00
K. D. Variometers (with winding form).... 1.75
Pioneer Wonder Brand Head Phones (2200 Ohms) 4.50
Condensers 1.50
PIONEER WIRELESS PRODUCTS CO.
329 East 29th St. New York

A Wise Judge

A LEGAL decision in the matter of a radio not being a nuisance was rendered by Chancellor J. E. Martineau of Pulaski Chancery Court, Arkansas, who had refused to restrain two radio enthusiasts, father and son, from operating their wireless outfit at Little Rock between 9 p. m. and 7 a. m. The restraining order was asked by several persons who complained of buzzing noises caused by the radio set interfering with their sleep. The chancery declared that the noise is one that persons must become accustomed to, just as they have become accustomed to noises of street cars, whistles, etc.

Why Forget Radio?

Legacies amounting to 5,000,000 francs were left to various French scientific organizations by the will of the late Prince Albert of Monaco. Among them were the following: A million francs each to the French Academy of Science, the Academy of Medicine, the Institute of Paleontology in Paris and the Oceanographical Institute. A million francs was also left to the Oceanographical Museum at Monaco.

SO MANY READERS ARE

disappointed in not receiving their copies of RADIO WORLD on the newsstands regularly, from week to week—due to early selling out by dealers—that we suggest that you place a standing order with your newsman. Ask him to save you a copy of every issue.

Even the Sigh of a Raccoon May Be Heard

THOSE who are leading blighted lives because they have never heard a mar-mot whistle to his mate will be cheered to learn that the Department of the Interior is considering a proposal for broadcasting the shrill evening chorus of thousands of the little fellows who are residents near Glacier National Park, says "The Tribune," New York.

Let us hope that the Department of the Interior will not fail to accept this proposal. It points the way to a broadening of the educational influence of the radio. If the wireless can diffuse the love plaint of the woodchuck, why cannot it also bring us the well chosen words of other animals? The radio program of the future may include the yap of the coyote, the chirr of the Kansas grasshoppers, the zing of the New Jersey mosquitoes, the singing of the Connecticut clams. Maybe—for the sake of our little ones, of course—Bossy will moo into the ether, Biddy cackle her paen of achievement and Rover bark his honest welcome in 360-meter wave lengths.

Nor must it be overlooked that there are other natural sounds of cultural influence. The roar of surf and waterfall and tornado, the crash of hailstones as large as eggs, the creak of our forefathers turning over in their graves—all these and more will no doubt be broadcast for our enlightenment some day. And then how gratifying it will be to the patient people of the East to hear the rumble of California's earthquakes and the steady pitter-patter of California's wet season rains!

Try This on Your Crystal Set

Sometimes it is very difficult to get a sensitive spot on your crystal. Try the following plan: Take a discarded crystal, and pulverize it, but not very finely. Put some of this inside a metal casing and screw it into the cup of your detector. You will be surprised to note how quickly you can locate a good spot.

Attention

Vacuum Tube Users

SAVE \$1.50 ON DETECTORS SAVE \$3 ON AMPLIFIERS

REPAIRING

Marconi, Moorhead, Electron Relay, A. P.
Radiotron UV200—UV201
Cunningham C-300—C-301
Detectors for \$3.50 Amplifiers \$3.50

Prompt Deliveries, Satisfactory Results
Reasonably Guaranteed

GEO. H. PORELL CO., INC.
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Subscribe direct or through your news dealer. \$6.00 a year, \$3.00 six months, \$1.50 three months. Radio World, 1493 Broadway, N. Y. C.

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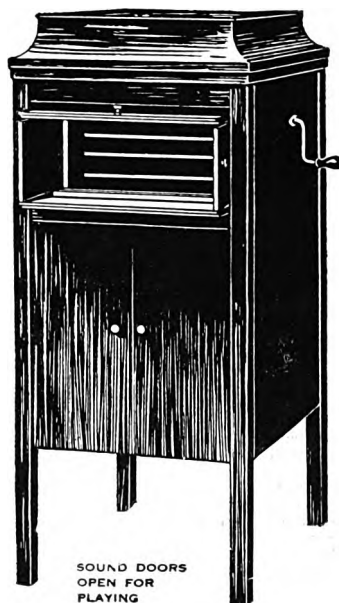
Invincible Radio Crystal \$5.00
Sliding Tuner Receiving Set }
Invincible Head Phones (3200 Ohms)..... 6.00
Ducon Plug 1.50
Necessary aerial and ground wire, ground clamp25
Wonderful Invincible Crystals, all sensitive, each30
Invincible Pneumatic Head Phone Cushion, per pair 1.00

Regular Price \$13.75
This set complete ready for instant use. No outside antenna—F.O.B. Chicago..... \$12.25
Guaranteed one year, also to receive as far as any crystal set.

Our new and original ear cushion gives solid comfort. No more irritation. No pressure, keeps in sound.
Keeps out noise. Avoid imitations. Agents and Dealers write for terms and territory.

Invincible Products Co., Inc.

159 N. State Street
Chicago, Ill.



SOUND DOORS
OPEN FOR
PLAYING

LUNDSTROM
STANDARD CABINET
FOR
RADIO SETS

\$14.50

This Rock Bottom Price on
Lundstrom Standard Cabinets
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RADIO DEALER

It is of proper size and construction and well adapted to receive a complete outfit, and radio fans can easily install their sets in them.

At this price it will be to your interest to order at once and be prepared for fall trade.

CURTIS N. ANDREWS

COURT AND PEARL STS.

BUFFALO, N. Y.

The Possibility of Combining Advertising with Broadcasting

RADIO is a medium by which millions of people can be reached. One of the problems in broadcasting is the station conducted solely for advertising purposes and which is operated with little regard for other stations or the public.

Many a concert or lecture has been spoiled by a station broadcasting advertising information such as the price of eggs or the bargains at some store, says "The Times," New York. The operator usually is compelled to alter tuning adjustments so as to pass over the advertising, and at the same time the concert is hushed.

It is hoped by many radio followers that a way will be found to associate advertising with radio in a manner which will not des-

troy the enjoyment of listening in. When a family is gathered at home listening to a speaker or an orchestra and its pleasure is interrupted by the voice of a butcher announcing the prices to prevail in his shop on the following day, it is just as objectionable as if the butcher had entered the room himself and proclaimed his price.

Broadcasting at present is far from perfect, and the conflict of programs between stations is chiefly caused by the bid for popularity. There are approximately 400 licensed broadcasting stations in the country today and it has been said that a number of them are operated for advertising purposes. These stations frequently interfere with large broadcasting stations. Many of

the programs consist of phonograph music, in no way comparable to a well-balanced program rendered by artists of skill and reputation.

One well-equipped, standard broadcasting station to cover a radius of 100 miles would be sufficient to serve the public, according to some experts, with minimum interference, instead of five, ten, or fifteen stations all grouped within a few miles of each other, as in some cities at the present time. Observers believe that manufacturers would profit far more by cooperating to support one high-powered station in each district. If the present growth of low-powered radio broadcasting stations continues as rapidly as in the last few months, radio is threatened with a loss of popularity. If radio is to operate on a high standard, the "spark coils" of radio-phone broadcasting must be limited and regulated, say the experts.

You Need All These!

Technical Articles Published in Radio World to Date

APRIL 1.

A 500-Mile Radiophone Employing a 5-Watt Tube, by Frank A. Hahnel.
"Tell Me, Please, How Will This Set Receive?" by E. L. Bragdon.
Short Cuts in Receiver-Circuit Design, by O. C. Roos.
Making a Short-Wave Regenerator, by Fred. Chas. Ehlert.

APRIL 8.

Do You Know Your Receiving Equipment, by James D. Gordon.
Why a Crystal Is Called a Rectifier, by Walter Emmett.
Is Radiotelephony Dependable? by O. C. Roos.
Mounting Crystals in Your Detector, by E. L. Bragdon.
Storage Batteries for Radio, by Fred. Chas. Ehlert.

APRIL 15.

First Principles of Electricity as Applied to Radio, by John P. Miles.
Your Storage Battery, by E. L. Bragdon.
What Makes Radio Possible, by Edward Linwood.
Ground Connection as Vital as Antenna, by Fred. Chas. Ehlert.

APRIL 22.

Solving the Puzzle of the Honeycomb, by Fred. Chas. Ehlert.
More About Your Storage Battery, by E. L. Bragdon.
Vacuum Tubes as Applied to Receivers, by Walter J. Howell.
How to Build the Loose Coupler and the Variometer, by Frederick J. Rumford.
The Best Aerial for a Receiving Station, by Edward Linwood.

APRIL 29.

Valuable Pointers on Aerial Construction, by Edward Linwood.
What is Meant by Tuning, by E. L. Bragdon.
Radio-Frequency Amplification and Regeneration, by Frank Armstrong.
Honey-Comb Coils and Condensers, by Edward Linwood.
Charging the Storage Battery, by E. L. Bragdon.
How to Construct the Variocoupler, by Frederick J. Rumford.

MAY 6.

The Advantages of Radio Frequency, by Harold S. Potter.
How to Construct, Protect and Operate a Storage Battery, by George W. May.
The Beginner's Catechism, by Edward Linwood.
Tuning and What Is Meant by It, by Fred. Chas. Ehlert.
New Frequency Amplifier Brings Faintest Waves in Strong, by G. W. May.

MAY 13.

My Practical V. T. Detector and Two Stage Amplifier, by Frederick J. Rumford.
The Principles of Radiotelegraphy, by Walter J. Howell.
The Reason for the Loop Aerial, by George W. May.
Tuning and What Is Meant By It, by E. L. Bragdon.
The Beginner's Catechism, by Edward Linwood.

MAY 20.

The Design of an Amateur Receiving Set, by C. White.
The B Battery and the Plate Current, by George W. May.

Radio Terms at a Glance, by Fred. Chas. Ehlert.
The Beginner's Catechism, by Edward Linwood.
Fire Undewriters' Rules, by Fred. Chas. Ehlert.

MAY 27.

The Beginner's Catechism, by Edward Linwood.
How to Make Your Own Condenser, by George W. May.
Tuning as Applied to Telegraphy, by Walter J. Howell.
Why the Condenser Doesn't Condense, by E. L. Bragdon.
Making Signals Louder with Two-Stage Amplifier, by George W. May.

JUNE 3.

The Cost of a Single-Circuit Receiver, by Howell W. Miller.
The Beginner's Catechism, by Edward Linwood.
How to Compute and Build a Fixed Condenser, by E. L. Bragdon.
Design for an Amateur's Receiving Set, by C. White.
Simple Method of Recharging a Storage Battery, by John Grayson.

JUNE 10.

Radio Receiver for Short Waves, by George W. May.
How to Filter Atmospheric Conditions, by C. White.
The Messenger Boys of Broadcasting, by E. L. Bragdon.
Are You a Member of the N. O. D. C.? by E. L. Bragdon.
The Beginner's Catechism, by Edward Linwood.
How to Construct One- and Two-Slide Tuning Coils, by George W. May.

JUNE 17.

The Vacuum Bulb's Start in Life, by C. White.
How to Select the Right Set, by E. L. Bragdon.
The Beginner's Catechism, by Edward Linwood.
Test of Inductance Coils, by Fred. Chas. Ehlert.
Short Waves from a Simple Receiver, by Stanley Bryant.

JUNE 24.

How to Make Your Radio Cabinets, by W. S. Standiford.
How the Crystal Detector Is Used to the Best Advantage, by C. J. Williams.
How to Construct a Long-Wave Regenerative Receiver, by George W. May.
Tested Invention of Major Armstrong Amplifies Set 100,000 Times, by John Kent.
Repairing Cracks in Hard-Rubber Storage Battery Jars, by W. S. Standiford.
The Beginner's Catechism, by Edward Linwood.

JULY 1.

Novel Unit-Detector and Amplifier, by Frederick J. Rumford.
Why You Must Use a Condenser, by C. J. Williams.
How Wave Lengths Travel, by Fred. Chas. Ehlert.
Radio World's Revised Dictionary, by Fred. Chas. Ehlert.
The Beginner's Catechism, by Edward Linwood.
Use of the Vacuum Tube Detector, by George W. May.

JULY 8.

Radio's Place in the Phenomena of Nature, by E. L. Bragdon.
The Function of the Loose Coupler, by Charles H. Plath.
Armstrong's Superregenerative Amplifier Fully Explained, by John Kent.
Operating a Transatlantic Station, by Fred. Chas. Ehlert.
The Beginner's Catechism, by Edward Linwood.
Reducing Strays and Static, by Fred. Chas. Ehlert.

JULY 15.

Assembling a Detector and Two-Stage Amplifier, by H. S. Standford.
Combined Radio and Audio Frequency Amplification, by C. White.
The Beginner's Catechism, by Edward Linwood.
Locating Your Aerial, by Harold Day.
Facts for Beginners, by Fred. Chas. Ehlert.

JULY 22.

When Your "Movies" Come by Radio, by Stanley Bryant.
Underlying Principles of the Vacuum Tube, by George W. May.
Practical V-T Detector Panel, by Frederick J. Rumford.
Revised Radio Dictionary, by Fred. Chas. Ehlert.
The Beginner's Catechism, by Edward Linwood.
Importance of Aerials to Radiation, by C. White.

JULY 29.

The Vacuum Tube as a Transmitter, by Charles H. Plath.
My 20-Kilowatt Tube and its Uses, by Irving Langmuir.
Importance of the Capacity Switch, by E. L. Bragdon.
The Truth about Lamp-Socket Aerials, by Harold R. Hart.
The Beginner's Catechism, by Edward Linwood.

AUGUST 5.

How to Construct and Operate the Armstrong Superregenerative Circuit, by John Kent.
Using Radio Frequency to Extend Range, by George W. May.
Things Every Radio Fan Must Know, by E. B. Hawley.
Revised Radio Dictionary, by Fred Charles Ehlert.
The Beginner's Catechism, by Edward Linwood.

AUGUST 12.

The Work of the Audio-frequency Transformer, by George W. May.
Practical Measurements of Capacity and Inductance, by W. A. Dickson.
Experimenting with Armstrong Circuit Produces Unusual Hook-up, by Dr. O. S. Kelly.
How to Secure Perfect Regeneration, by Fred. Chas. Ehlert.
The Beginners' Catechism, by Edward Linwood.

AUGUST 19.

How to Build a Portable Field Buzzer, by De Witt H. Thompson.
Using Two Tubes for Receiving, by C. White.
The Storage Battery as an Important Factor in Radio Reception, by Donald Van Wyck.
The Use of Capacity in a Circuit, by George W. May.
The Beginner's Catechism, by Edward Linwood.

Any single copy of Radio World, beginning with No. 1, mailed on receipt of 15 cents postpaid. Any seven issues for \$1.00. The full 21 numbers sent for \$3.00. Or send \$4.00 for 7 months (30 numbers), or \$6.00 for 1 year (52 numbers) and have your subscription start from No. 1. Radio World, 1493 Broadway, New York

Variable Air Condensers

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Made with Pure Aluminum Die-Cut Plates
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Includes all necessary parts, with instructions for assembling.
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Constant voltage, large amperage. Will run two months without recharging.
Attractive Dealers' Discounts
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"EVERYTHING IN INSULATION"
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BUILD YOUR OWN

Complete 50c. instruction book for 20c. only on radio reception and how to make eight classes of crystal and vacuum tube receiving sets. Wonderful information makes you understand radio. With every order we send free our price list of parts prepared especially for the several sets described. Buy direct from factory and save many dollars. Both instruction book and price list sent on receipt of 20c. only. Money back if not pleased.
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22½-45 & 105 VOLTS

NOISELESS DEPENDABLE GUARANTEED
ASK YOUR DEALER

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United States Navy Leads in Radio Development

Considerable credit is always given the United States Navy for its pioneer work in many lines, among them electrical development; but a recent conversation with an officer of the radio section revealed the following items which are not generally known:

In the electrical field, the Navy was the pioneer in many lines. Starting with the incandescent lamp, every new electrical discovery was fathomed and adopted by the Navy before its commercial use had been found practicable or profitable.

The Navy Department enabled the General Electric Company to produce the first electrically propelled ship in the collier "Jupiter," now the airplane carrier "Langley."

The radiophone which, through broadcasting, has become the talk of the country, is simply the coming into commercial use of a development that has been in general use in the Navy for the last five years. It was installed, experimentally, in 1907 for communicating between the ships of a fleet.

Many of the great radiotelegraph plants that now encircle the globe are owned and operated by the Navy. Without the Navy's interest, experiments and research, as well as their substantial contracts for apparatus, the radio industry in this country, it is said, would be in foreign hands.

The radio compasses that flank our great seaports are owned and operated by the Navy; but through their use any vessel can be told to a degree what her direction is from any station within call and thus fix her position whether in fog or storm. This makes for better navigation and saves many a big liner from disaster as well as delay in making port.

Static interference is an element to be reckoned with in all phases of radio work and has never been entirely eliminated. The Navy Department, however, has been engaged in research work looking to the elimination of static for a longer period than any other Government department. While results have been attained which have reduced interference from this source to about half, it has not yet been completely removed.

New Broadcasters

SIX limited broadcasting stations were licensed by the Department of Commerce on August 11:

WJAQ—Capper Publications, Topeka, Kansas.

WAJT—Kelley-Vawter Jewelry Co., Marshall, Mo.

KFBH—Thomas Musical Co., Marshfield, Oregon.

WLAJ—Waco electrical Supply Co., Waco, Texas.

WAJU—Yankton College, Yankton, S. D.

WJAS—Pittsburgh Radio Supply House, Pittsburgh.

An American has invented a radio receiving set which fits into a finger ring. We await with interest the announcement that another American has invented one which is only visible through a microscope.—The Passing Show (London).

Superior Radio Products

All Parts, Receiving Sets Complete and in Units. Send for Description and Prices. Prompt Shipment on Mail Orders.
Dealers Write for Proposition
RADIO OUTFITTING CORP.
Mfg. High Grade Radio Apparatus
410 East 34th St. New York, N. Y.

Rocky Mountain Crystals

BETTER THAN GALENA
The most sensitive mineral rectifier known. Can also be used with one or more stages of amplification.
Mounted, 35c.; Unmounted, 20c.; Postpaid
Manufacturers, Jobbers, Dealers, Clubs,
Apply for Special Trade Prices
Rocky Mountain Radio Products, Inc.
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RADIO BOXES

All radio carpentry work our specialty. Write for SPECIAL PRICES
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373 Canal Street New York City
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THE BEST LITTLE THING IN RADIO

EBY
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Place your fall orders now
Latest reductions enable us to quote attractive prices.



Corporal Ensign "H"
H. H. EBY MFG. CO., PHILA., PA.

Your Opportunity To Profit

because of the Tremendous Wave of Radio Enthusiasm now Sweeping over the World, is at hand.

"Sparks," a publication devoted to the outlook for the

Acme Battery and Radio Corporation

an established, growing concern, clearly outlines the Profit Possibilities of the company's shares.

Send for "Sparks" at Once.
There is no charge.

Industrial Expansion Service
No. 1674 Broadway New York

This Fall and Winter
The BIG Thing
will be

RADIO!

Every radio expert—from Marconi down—who has analyzed the situation says that radio will take the predominant place over all other matters that may occupy the public mind. To keep thoroughly posted, subscribe for

RADIO WORLD

Subscribe direct or through your newsdealer. \$6.00 a year, \$3.00 six months, \$1.50 three months.

AND YOU WILL RECEIVE RADIO WORLD EVERY WEEK.

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1493 Broadway New York

ADVERTISING SOLICITOR WANTED

High-class advertising man, acquainted with agencies, wanted by successful radio weekly. One with experience on radio or electrical publication preferred. Give full details as to past experience and salary or commission expected. Letters will be held in strictest confidence. Address: Publisher, 30 Fifth Ave., New Rochelle, N. Y.

Fifty-two issues for \$6.00. Sub. Department, Radio World, 1493 Broadway, N. Y. C.

The Octagon Elec. Co.

We Make and Install Complete Radio Sets.
Full Line of Accessories Carried in Stock.

The Octagon Elec. Co.

219 West 14th St. New York City

RADIO SUPPLIES— RADIO SUPPLIES

We carry a full line of Radio Goods
Dictograph Head Sets, Vario
Couplers, Everett Head Sets,
Variometers, Transformers,
1700 Meter Loose Couplers,
Dials and Knobs.

Send 50c for 20 Blue Print
Hook-Ups

Radio Sets Made to Order
SUNBEAM ELECTRIC CO.
71 3rd Ave., New York City

DOUBLE HEAD PHONES



BOYS! A REAL RADIO SET ABSOLUTELY FREE

RUSH your name and address and we will tell you HOW you can get this RADIO SET ABSOLUTELY FREE. RADIO SET comes to you complete, with single slide tuning coil, crystal detector and phone condenser. AND DOUBLE HEAD PHONES. No batteries required; no experience. Write 10-day for Free Radio Plan.

HOME SUPPLY CO.
110 Nassau St., Dept. 537
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"Fading" and How to Detect It Easily

MOST every amateur is striving for efficiency whereby signals may be brought into the receivers at their loudest signal-strength. In order to accomplish this we must have a set that is well designed, not merely thrown together.

One thing of great importance should be particularly avoided, and that is resistance. There are two kinds of resistance that effect a receiving circuit. One of these is termed low frequency—the kind with which we generally deal in usual forms of electrical work, and the other high-frequency resistance—the kind that makes itself manifest only in radio and other high frequency circuits. Resistance of any kind in a radio circuit tends to damp out the waves. We then have broad tuning. If the resistance becomes too great it will be impossible for the circuit to operate at all.

Low-frequency resistance is caused chiefly by using wire that is too small for the circuit; also by poor connections and unsoldered joints where, probably, grease and dirt have collected. The aerial system should have wire that is larger than that needed for the other circuits. Nothing smaller than No. 14 should be used.

High-frequency resistance is usually caused by employing wire having too small a carrying surface.

YOU NEED THESE—

To Complete Your

ARMSTRONG SUPER-REGENERATIVE CIRCUIT

We have for immediate delivery:

5 M. H. Choke Coils.....\$2.50
100 M. H. Choke Coils\$3.00
12000 Ohm Resistances.....\$3.00
.005 MFD Tested Condensers.....75c

The above parts have been tested in our Demonstrating Set, and are made of the best material and guaranteed.

SEND CHECK OR MONEY ORDER. MONEY WILL BE REFUNDED if material should prove defective after 6 day trial.

Durham & Company

RADIO ENGINEERS

1936 Market Street
PHILADELPHIA, PA.

New Laws Would Improve Broadcasting

By Harold Day

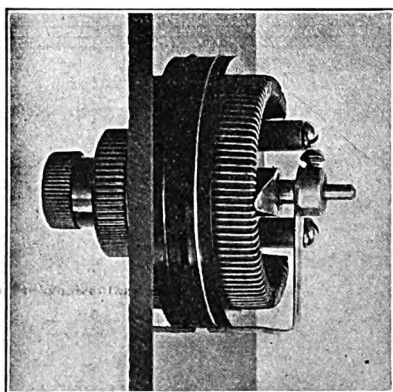
IT is a truism that needed legislation nearly always lags behind the heels of progress, but it is to be hoped that radio will mark a new era in this respect. The Government has already taken official cognizance of the new science in so many ways particularly in respect to its value as a life and property saver, that perhaps means can be found to urge upon it the crying importance of speedy attention to the broadcasting situation.

At the present time, as is well known, all the numerous existing stations and the ever increasing number of new ones are all allotted 360 meters for their programmes with permission to send out official report at 485 meters. This might have been found satisfactory when stations were few and far apart. But now that broadcasting has become nearly, if not quite, the most important phase of radio and surely the most active, it is imperative that this narrow restriction be speedily removed. In the larger areas there has been some friction between stations and much earnest effort at mutual accord. Nevertheless, interference continues, and at times reigns supreme.

It is obvious that since broadcasting is in so high favor with the public, that the number of stations will and should increase indefinitely. One station is no more adequate to serve the varied needs and tastes of a large community than one theatre. If the government would immediately recognize the new conditions, increase greatly the wave hands assigned to broadcasting, and make possible an allotment of wave-lengths rather than of hours among the stations, the entire quality of broadcasting would soon improve, competition would compel the best sort of programme, since the listening public could tune out the weaker sisters rather than, as now, listen indifferently or wearily shut off the current when the material on the air failed to satisfy.

Improved Vernier Rheostat

An absolute necessity in the new Armstrong
Regenerative and in Radio Frequency
Amplification



VERNIER

With Dial\$2.00

Without Dial\$1.50

REGULAR

With Dial\$1.50

Without Dial\$1.00

We are the only manufacturers
selling a regular rheostat with dial
for \$1.50.

MAXIMUM DISCOUNT TO DEALERS

THE TECO RADIO CO.

P. O. Box 3362, Boston, Mass.

Factory: 165 High St., Waltham, Mass.

Radio World, 52 issues, \$6.00.

Subscribe direct or through your
news dealer. \$6.00 a year, \$3.00 six
months, \$1.50 three months. Radio
World, 1493 Broadway, N. Y. C.

Last-Minute Radio News!

*Important Items Tuned in by Radio World Reporters
Just Before Going to Press*

Lee de Forest, American radio expert, exhibited several reels of moving pictures in Berlin, Germany, in which the photographed persons actually spoke to the audience. One even played the violin, and it sounded as if the player were in the same

powerful radio-broadcasting station now being erected on the Municipal, New York City, will have a range, approximately, of 1,250 miles. Its power equal to that of any privately owned broadcasting station in America. It is close to \$50,000. Programs will embrace entertainment and information of the now sent out by the various broadcasting stations, as well as educational on health, fire, and crime prevention and municipal government. The location is situated on the twenty-fourth story of the Municipal Building. There is almost ideal for broadcasting purposes. Commissioner Whalen states that without tearing down a single partition it will be possible to install a generator of these rooms and equip the other as a studio comparable to the best in the city. The power for the station will be furnished from the city's own plant.

The first radio theatre will soon occupy a room in the Grand Central Palace, New York City. The theatre will seat over a thousand persons. There will be a dancing floor in connection.

The use of radio in mine rescue work has been suggested and it is probable this method would assist mine safety. Rescue cars and trains stationed at various points throughout mining districts are to be equipped with apparatus to receive and transmit messages in case of disaster.

Nearly 7,000 persons have already answered the Chicago "Tribune's" call for a radio caucus. Some of them submitted interesting ideas for radio broadcasting while others submitted their names and addresses to the radio editor.

A new record in summertime radiotelephone feats has been attained by the broadcasting station of the Atlanta "Journal." Despite static, the radio operators of the newspaper using a Western Electric transmitting set, broadcasted a concert which was heard distinctly on the "Oneonta," a river tug, anchored at Columbia Harbor, Astoria, Oregon.

Great Britain expects to build eight broadcasting stations, to cost about \$100,000. To support these the government will charge a "listening in fee" of \$2.44 for receiving set.

A new broadcasting station in Aeolian Hall, which is intended for commercial broadcasting, has been assigned, for the present, by the United States Department of Commerce, a wave length of 360 meters.

FOR SUCCESS

WITH THE
**ARMSTRONG
SUPER
REGENERATIVE
CIRCUIT**



AN
ABSOLUTELY
NOISELESS
CONDENSER

The new Armstrong Super-Regenerative Circuit requires constant fixed capacities of .005 and .0025 m.f.d.—to be efficient, these condensers must be absolutely silent.

MICON

Tested Mica Condenser

the only guaranteed noiseless condenser of absolutely constant capacity. Made in .005 and .0025 m.f.d. capacities, especially for this circuit. It may be had in all sizes from .0001 to .005. MICONs are manufactured in a seamless metal case, over the entire surface of which an even pressure has been applied. For this reason MICONs remain at correct capacity.

MICON, .0025 m.f.d. 50
MICON, .005 m.f.d. 75

If your dealer cannot supply you, send us his name and receive free a complete diagram of the new ARMSTRONG Super-Regenerative Circuit absolutely free.

Chas. Freshman Company, Inc.
Sole Manufacturers
290 Hudson Street, New York City

Latest broadcasting map 15c. That is, a complete broadcasting map appeared in Radio World, No. 8, dated May 20. Mailed on receipt of 15c. Radio World Company, 1493 Broadway, N. Y. C.

Col. E. H. Green's Home a Radio Palace

ROUND HILLS, the country home of Col. Edward H. R. Green, son of the late Hetty Green, at New Bedford, Mass., sounds like a haunted estate since its owner has been bitten by the radio bug, says "The World," New York.

In the sun room of the house stock quotations, weather reports, music and speeches flow all day from the receiving station there. In the boat house come the booming tones of the amplifier with which Col. Green expects to entertain the crowds at the coming boat races.

That's all there is now, but Col. Green has not done yet. Within a few days his new six-room studio, housing the most complete broadcasting station in the country, will be finished.

Col. Green is not enjoying his radio pleasures alone. The first tryout of his truck was made last Thursday and it went rolling about the neighborhood reeling off concerts and talk from Newark and Schenectady for the delighted farmers.

But the amplifier is the Colonel's pet. This is just such a machine as was used to make President Harding's inaugural address audible to the 125,000 gathered about the Capitol. At Round Hills the sound will be plainly heard over a radius of five miles, and Col. Green will place his apparatus at the disposal of the Commodore to issue instructions and announcements at the boat races.

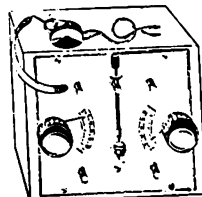
"Anybody who has a set of two good ears has all the required receiving apparatus," the Colonel says, "I'm so interested in this thing that I haven't time for anything else. I'm like a child with a new toy, who can't be induced to put it down."

COMPLETE RADIO SET

READY TO
LISTEN IN

\$14.50
C. O. D.

FOR THE COMPLETE
SET, INCLUDING
AERIAL
(Regular price: \$25)



This outfit is intended for the fan that appreciates a good thing. It includes a high grade tuner with a 40 to 60 mile radius, 1100 ohm phone, insulators, and complete aerial set. SEND NO MONEY unless you wish. Simply send us your name and address, and we will mail immediately. You pay Postman on arrival, our price, plus postage. Satisfaction guaranteed, or money refunded.

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55 BROADWAY NEW YORK

For Finer Tuning Use a



Every-Wire-Contact Coupler
LIST \$7.50

Write for Pamphlet

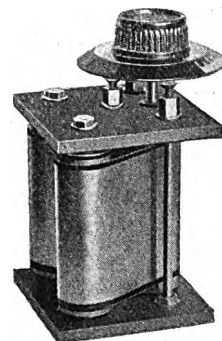
MORELAND SALES CORP.
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Newark New Jersey

The "VARIO-PERM"

(TRADEMARK)

The Sensitive Variable
Condenser for Radio.



(Licensed under
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NO SHORT-CIRCUITING
POSSIBLE

NO LOOSE ELECTRICAL
CONTACTS

Twice as Sensitive as Plate
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PERMANENT SATISFACTION

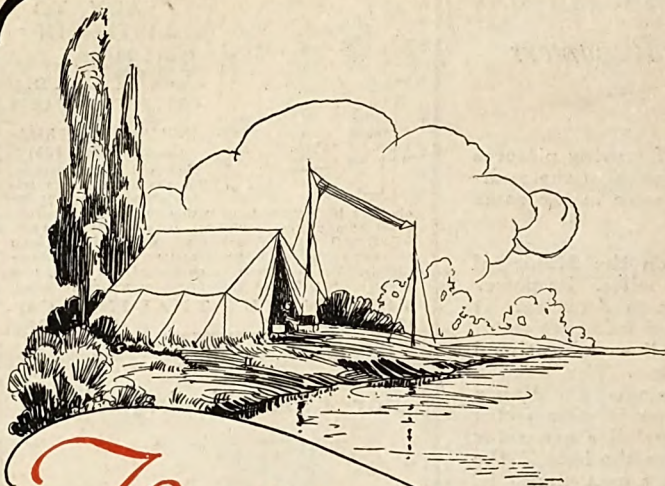
This UNEXCELLED TYPE OF
CONDENSER is now offered for
the first time at popular prices.

Mail orders filled.
Dealers write for terms.

Rating
.001 mfd (43 plate) \$5.00
.0005 mfd (23 plate) \$4.25

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SCARBOROUGH, N. Y.

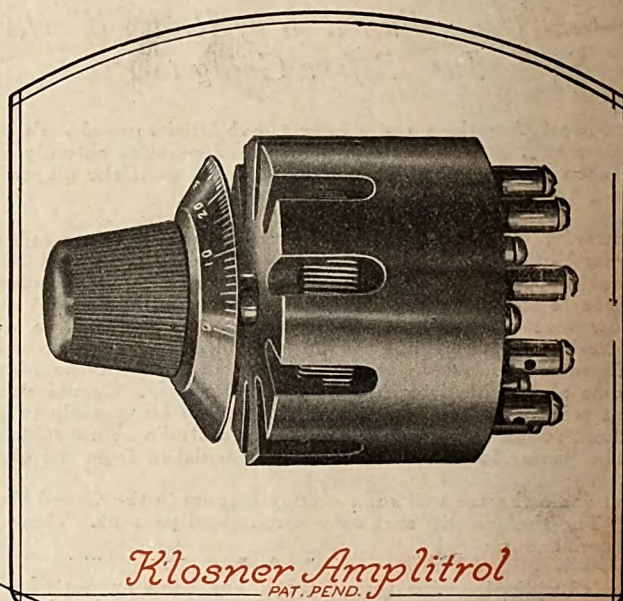
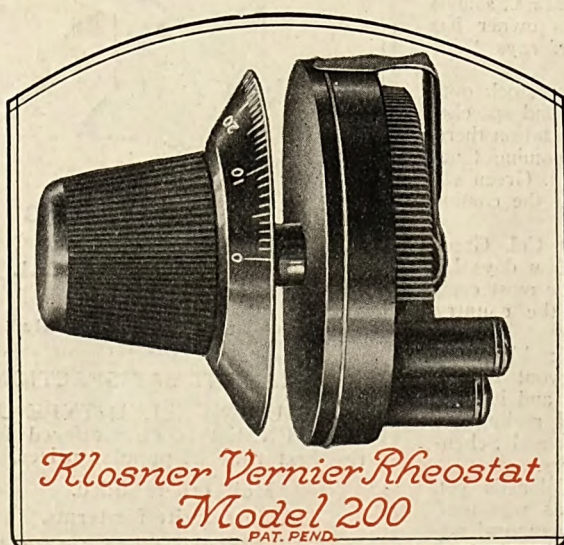
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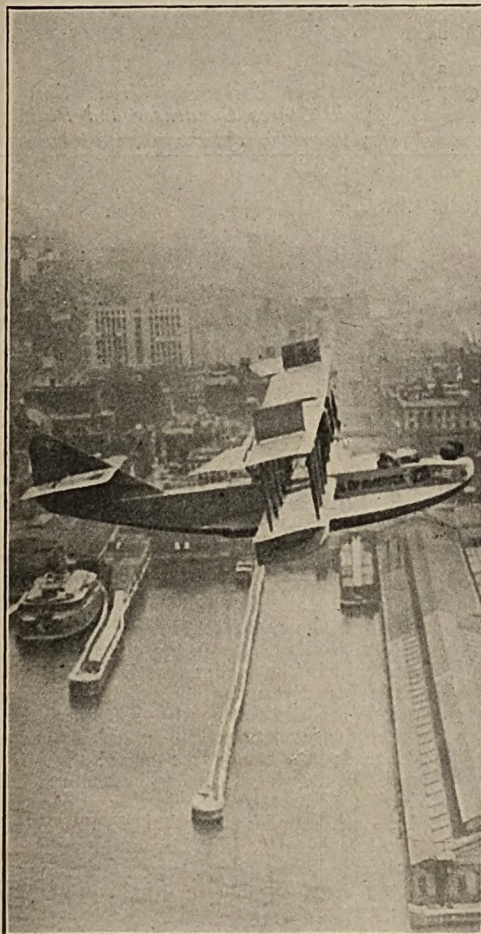
Klosner Improved Apparatus Co.,
2024 Boston Road
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RADIO WORLD

Entered as second-class matter, March 28, 1922, at the post office at New York, New York, under the act of March 3, 1879

I L L U S T R A T E D

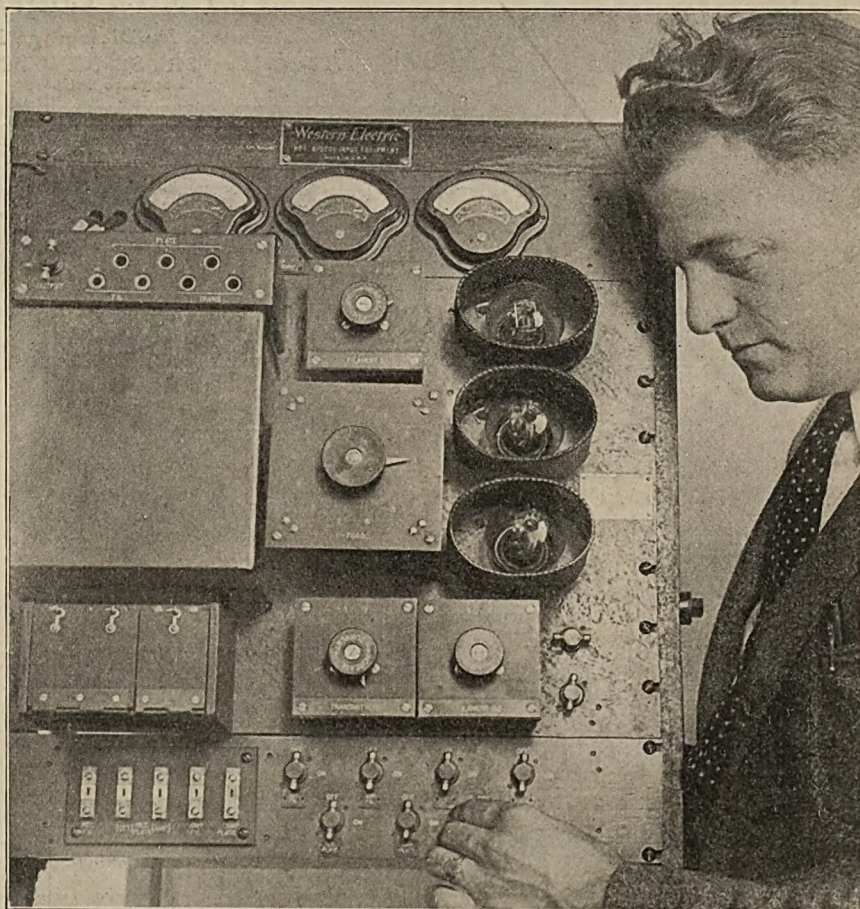
Radio-Equipped Airplane



(C. "P. & A. Photos")

The "Sampiao Correia," Brazilian airplane, flying over New York City on her start to Rio de Janeiro. This "ship" was equipped with a receiving set of the latest design.

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(C. Kadel & Herbert News Service)

This is the latest radio device. It amplifies the voice for the transmitter. It is known as a speech input amplifier. It enables the transmitting operator to hear more clearly. By so doing he is able to give better service. This amplifier is now in the laboratory of the College of the City of New York.

2 Circuits for Regenerating Loud Signals

See
Page 8

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The publisher has reserved a limited supply of the first 22 issues of RADIO WORLD for the benefit of new readers who want to become subscribers and have their files complete from the first issue. The first 22 copies will be mailed postpaid on receipt of \$3.00; or better still, subscribe now for nine months (\$4.00), or twelve months (\$6.00 for 52 issues) and have your subscription start with No. 1. Radio World Co., 1493 Broadway, New York City.

He Tried to Stop a Radio "Fight"

A POLICEMAN in Pittsfield, Massachusetts, heard the shouts and curses of a fight in Schenectady, New York, and though it was many miles off his beat, courageously tried to mingle in the row and failed. It was a radio fight.

A. H. Everest, a Pittsfield man, has a radio receiving-set with loud-speaker attached. He was listening to "The Wolf," Eugene Walter's play recently produced by E. H. Smith and players at WGY, the broadcasting studio of General Electric at Schenectady.

In the big scene of the play "Hilda," a greatly misunderstood young woman, screams "Liar! Liar!" at her father. Mingled with the screams were the guttural curses and shouts of the rough men of the Canadian woods. It was these screams and shouts which the policeman heard at the home of Mr. Everest. The officer had been instructed to discourage fights even within the sacred precincts of the home when the fights tended to annoy the neighbors. He rapped at the front door and demanded, "What's the trouble?"

Mr. Everest pointed to the loud-speaker as the hysterical "Hilda" was becoming a bit calmer. The officer, sizing up the situation, sat down for the rest of the "fight."

The story was too good to keep, so Mr. Everest wrote to WGY, in part, as follows: "The Wolf" came over so realistic last night that in the third and final episode, a passing policeman thought my wife and I were fighting. He rapped at the door and when he saw what was going on, came in and listened to the rest of the performance."

Subscribe direct or through your news dealer. \$6.00 a year, \$3.00 six months, \$1.50 three months. Radio World, 1493 Broadway, N. Y. C.

RADIO WORLD

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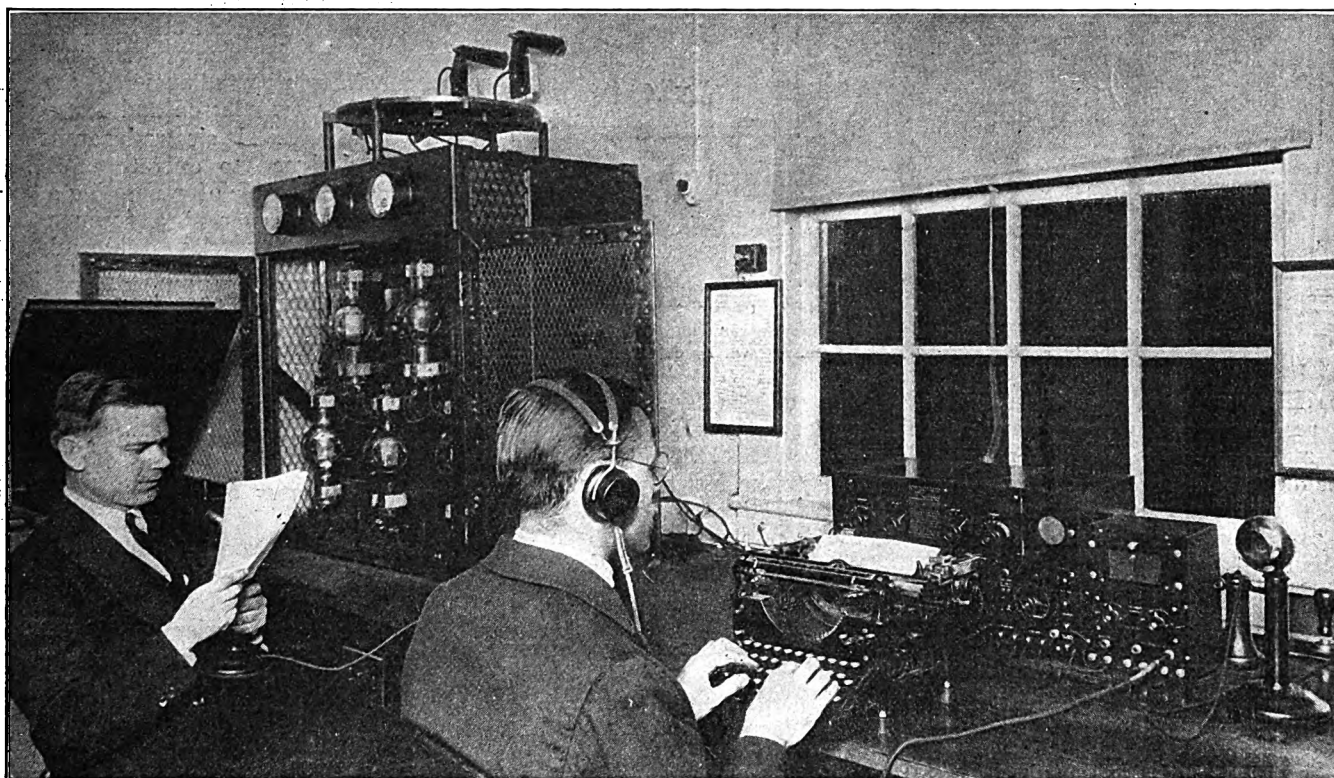
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Vol. 1, No. 23

September 2, 1922

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Sending Out the Weather Reports from WJZ, Newark



(C. Kadel & Herbert News Service)

Sending out the weather reports from WJZ, the big and busy broadcasting station at Newark, N. J., is a broadcasting feature of unusual interest. On weather forecasts depend the rise or fall in the values of commodities of every nature; for by foretelling what atmospheric changes may take place, the merchant is given a chance to buy or sell, the farmer to reap or sow, the jobber to arrange his prices—all of which has a direct bearing on the public. The apparatus in the left corner is a transmitter. The operator is broadcasting a report. His assistant at the typewriter is taking down what he says in order that the news may be checked up for absolute correctness. This is of vital importance. It is necessary to the general welfare of this country that all weather reports be correct to the last period.

Latest Important Radio News of the Week

Alfred Frankenthaler, lawyer, formerly assistant in the Alien Enemy Bureau, Department of Justice, says that the German Corporation, Telefunken, which owned and operated the Sayville, Long Island, station prior to the World War, expects compensation from the United States.

* * *

The copper and brass industries have been greatly aided by radio activities. Unusually large demands are reported by manufacturers of copper wire, sheet tube, and bar stock for copper for use in radio apparatus.

* * *

After conferring with Nathan Burkan, attorney for the American Society of Authors, Composers and Publishers, representatives of the radio broadcasting stations announce that they will pay royalty on the music they use, the amount to be determined later.

* * *

Competing with Great Britain, France, and Germany, America was successful, according to a radio message from E. F. W. Alexanderson, chief engineer of the Radio Corporation of

America, in securing a contract with the Swedish Government to furnish apparatus for a high-power radio station to handle direct communications between the United States and Sweden. The total cost of the station erected will be over \$2,000,000.

* * *

Joseph Santley of the "Music Box Revue" is preparing a one-act play to be presented entirely by radiophone. In addition to the dialogue, all the entrances and exits and all the mechanical effect will be reproduced by radio. Mr. Santley describes it as an "Ear-Play."

* * *

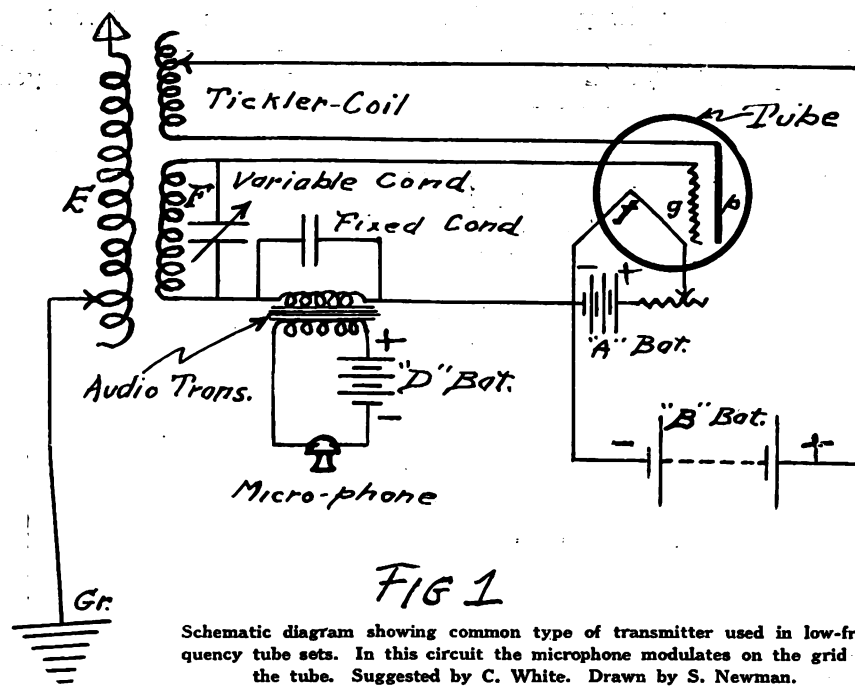
A man attacked several young girls in Union Hill, New Jersey, the other day and made his escape. Police Lieutenant Quilter immediately broadcast a description of the fugitive.

* * *

Defense of the Atlantic Coast is now assisted by forty-five radio compass stations, most of them located in groups near the chief American ports. There are four such stations near New York Harbor. Their main purpose is to detect the approach of hostile warships. In peace time they serve commerce.

Generating C-W for Transmission

By C. White, Associate A. I. E. E.



THERE has been much discussion recently between the old amateur and his brother novice concerning the interference of signals and concerts. The old amateur feeling that, because of his long standing in the radio field, he is much hurt to have his code impeded by strong radiotelephone broadcasting stations. On the other hand, the novice declares that if the "old-timer" should send on a different wave-length and interrupt a well-planned concert by code, he should be severely punished by law! The "key sitter," in most cases, is sticking to his wave band, but the trouble lies in the fact that most amateurs who transmit code still have the old-time spark station; and, as most of us know, the wave sent out by such a station is damped: that is, it contains virtually some of all frequencies.

It is difficult to fully understand this, but it is the underlying trouble of the damped wave. Of course, there is one predominating frequency which gives the maximum response in the receiver when it is tuned to that particular frequency. But it is the frequencies near this particular frequency that produce considerable interference in broadcasting. The solution to the whole problem lies in the gradual adopting of C-W for universal transmission of all wireless signals.

The adoption of C-W means that the wave bands need not be so wide because it is possible to tune very close with C-W since there is present but one fundamental frequency. It must be strictly observed that to fully accomplish such an ideal tuning condition,

the users of this style of transmission must filter their wave to free it from kinks; or undesirable harmonics. He must also take strict precautions that his wave-length remains constant. Personally I notice, while listening, in that there are a number of C-W stations that do not hold their carrier-wave frequency constant. This makes it quite difficult for the operator at the receiving station to keep in tune especially if he is using a sensitive short-wave regenerative receiver. But if these two objections are removed, then there is no argument against the general use of C-W.

The vast strides in the advancement of the radiotelephone during the World War and, recently, because of the public interest taken in broadcasting has made the study of the various types of transmission in this particular use of C-W especially interesting to the amateur, although he does not intend to transmit messages or to broadcast.

Any type of radio transmitter operates on the well-known principle of radio dissipation of energy. To make the antenna radiate energy, the wave supply must be of a high frequency since, practically, no power may be radiated at frequencies as low as voice frequency. Therefore, we are accustomed to call the radiating frequency, "radio frequency," which ranges from 10,000 to 3,000,000 cycles a second. The C-W frequency in telephone work is known as the carrier frequency and on it the frequency of voice waves is super-imposed. This superimposition of the voice wave on

the carrier wave is commonly called the modulation of the carrier wave; hence we can clearly divide a radiophone transmitter into two separate parts; or, at least, two separate functions which must be performed, namely: the generation of the carrier wave and the modulation of the same.

There are three ways of generating C-W oscillations:

- 1—The high-frequency alternator.
- 2—The Poulsen arc.
- 3—The three-electrode vacuum tube.

The high-frequency alternator, generally known by the names of their inventors, Alexanderson and Fessenden, is a mechanical electrodynamic machine designed to operate at a high speed and capable of generating a large amount of power at a frequency as high as 100,000 cycles per second. Of course such a machine is only practical for long-distance transmission at relatively high wave-lengths. The Poulsen arc is an oscillating arc, also capable of generating a large amount of power and, like the Alexanderson alternator, has only a commercial application. But the vacuum tube is an ideal generator of oscillations of any frequency. It generates a small amount of power in comparison with the two devices first mentioned.

There are many possible ways of modulating the carrier wave depending upon the size of the transmitter and the type of high-frequency generator. One common method used with the alternator is to place the microphone on the field circuit of the alternator and thus modulate the amplitude of the generated wave by varying the strength of the magnetic field. Another method that may be employed either with this type of machine or the Poulsen arc is accomplished by placing the microphone in series with the antenna circuit. But since most C-W stations, either code or telephone, use vacuum tubes, I shall further illustrate and explain this type of station in detail.

In Figure 1 is shown the most common type of transmitter used in low-powered one-tube sets. In this circuit, the microphone modulates the amplitude of the oscillations by changing the average potential impressed on the grid of the tube. But although it has now become an almost general practice not only in large sets, but also in portable ones, to accomplish modulation by the use of a separate tube, the combined single-tube method will amply serve those who seek simplicity and are not particular about the maximum efficiency. To fully comprehend the action of this type of transmitter let us analyze the changes that take place

(Continued from preceding page)

when the operator talks into the microphone. First, before his speech starts, the vacuum tube is generating oscillations (carrier waves) in just the same action as a regenerative receiver, the frequency being determined by the relative value of the coil F and the variable condenser. The amplitude and constancy of the same are maintained by means of the regenerative tickler coil.

As soon as the voice waves of the operator impinge upon the diaphragm of the microphone an alteration of the current in the D battery circuit is immediately established. These current variations in the phone circuit are transferred by means of an audio

silence to exist and studying the action of the oscillator unit in the steady state. In an exactly analogous method, local oscillations are generated as in the regenerative receiver—the frequency being maintained by the coil F, the variable condenser, and the tickler coil.

These high-frequency carrier waves are kept from going into the modulator circuit by means of a choke coil which has a high impedance to waves of radio-frequency and low impedance to waves of audio-frequency. In other words, the choke coil acts just the same as a mechanical check-valve on a water pipe, allowing current to enter the oscillator from the modulator but prohibiting the reverse operation. When

This rapid change of current in the plate circuit causes a varying electromotive force to be set up in the iron-core inductance G. Now, since, the B-battery circuit is common to both tubes, this varying electromotive force will be impressed on the plate of the oscillator, thus causing the amplitude of the locally generated oscillations to change in some manner proportional to the various sounds impinging on the microphone diaphragm.

Of course the two types of transmitters I have just explained are only the very simplest forms. Many of our broadcasting stations not only have multiple-tube circuits but, also, filters of various kinds. The general use of filters in radiotelephony is to be encouraged, not only for the reasons I have previously set forth, but because their use makes it possible to transmit phonograph music and music played at a point quite remote from the broadcasting station where it becomes necessary to use a ground wire. As examples of the former there are many stations that now broadcast phonograph music by filtering out the objectionable needle grind, thus making it quite impossible for the listener to determine whether the music is real or reproduced. As an example, I shall quote the case of Gimbel Bros., department store, Philadelphia, where music is broadcast through their station from the L'Aiglon Cafe, about ten blocks from their store. This is made possible by placing the microphones at the cafe and sending, by means of a private land wire, to the radio station where the noises of the land wire are filtered out and the real music is successfully amplified.

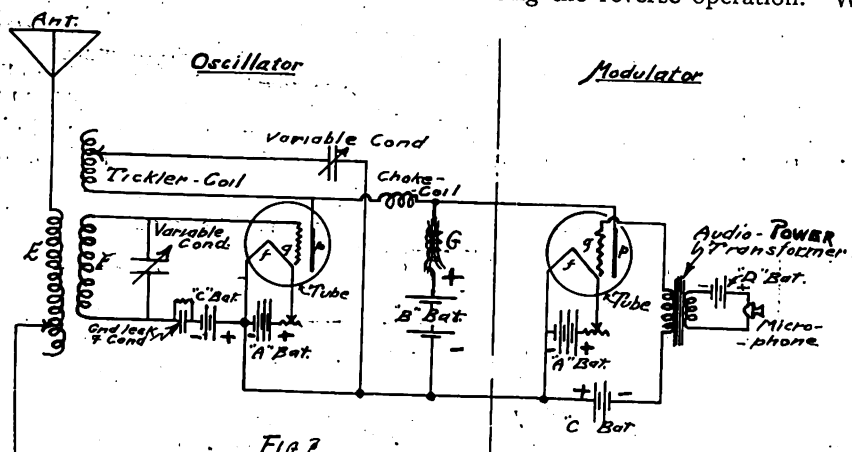


Fig. 2
Schematic diagram of another type of set operated as illustrated. The tickler coil is employed here as direct feed-back. Suggested by C. White. Drawn by S. Newman.

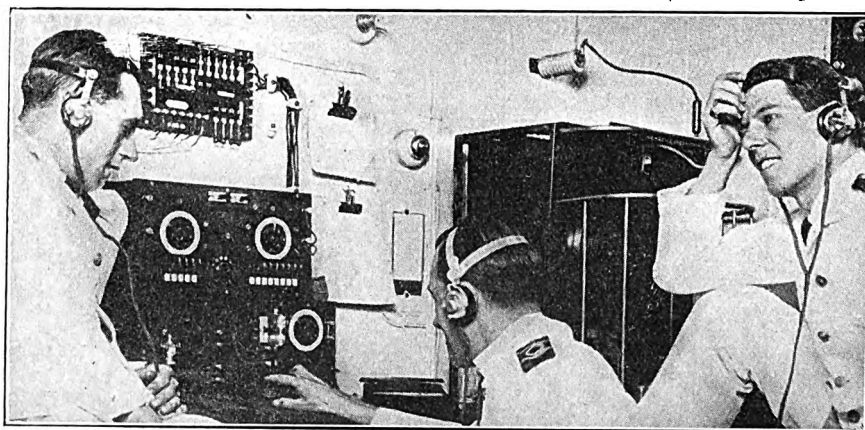
transformer to the grid circuit, where they act directly by affecting the amplitude of the local carrier-wave oscillations generated by the tube. The fixed condenser is shunted across the secondary of the audio transformer in order to reduce the impedance of the grid circuit to the high-frequency carrier waves.

The perfection and use of a separate modulating tube has been due largely to the persistent and efficient skill of Heising and a corps of very competent radio and telephone engineers. The multiple-tube transmitter possesses several advantages over the single-tube set, owing to the fact that flexibility of operation of the two separate functions is accomplished by means of an independent oscillator and modulator.

In Figure 2 one type of set operating on this principle is illustrated. The reader will note that the oscillator part is quite similar to the ordinary regenerative receiver circuit, except for the fact that the regenerative element, consisting of the tickler coil and its variable condenser is shunted across the B battery whereas, in the receiver, the tickler coil is not in series with a variable condenser and is in series with the B battery and receiving phones. The functioning of this set may best be visualized by considering

the speaker causes the current in the grid circuit to be disturbed by talking into the microphone, there is a corresponding change in current, in the plate circuit connected with the modulating tube.

Listening to Music 500 Miles Away



(C. International News Reel)

M. A. C. Lund, chief radio officer of the "Empress of France," and his assistants, W. J. Howlett and D. C. Nye, listening to the radio program of WGY, Schenectady, N. Y., while their steamer was at her dock in Quebec, 500 miles away. They are photographed listening to the opera, "Robin Hood." In her wireless work the "Empress of France" uses a 1½ quenched spark and continuous-wave-set receiver, with 14-electrode vacuum tube. Her range for picking up messages is 3,000 miles, and her sending capacity about 2,000 miles. In her trips from Great Britain to Quebec, Canada, she keeps in touch with the Leaflet Station, Oxford, during the entire voyage. Many times Radio Officer Lund has picked up calls for medical assistance in mid-ocean, and when the case has been urgent has been able to give advice by wireless from the doctor of the "Empress" or arrange matters so that a doctor from the "Empress" could attend the case in person.

Wonders of Radio-Frequency Amplification

By H. S. Potter

MOST wideawake amateurs to-day are experimenting with radio-frequency amplification. A number who have not taken up this fascinating branch of radio are not fully acquainted with the subject. I hope to give them a few valuable suggestions in this article.

The several common systems are the resistance coupled, the air-core transformer coupled, the iron-core transformer coupled, and the tuned plate. Of these the resistance-coupled system works best on long waves, but is unsatisfactory on short wave-lengths.

The air-core transformer coupled system, excellent on short waves, seems to be neglected in favor of the system using transformers having iron cores. These iron cores are made with very thin laminations of soft iron, wound with two windings of wire, of the proper number of turns for the wave-length range to be covered.

Unlike audio-frequency transformers, these transformers designed for radio-frequency work cannot be used on the whole band of wave lengths in use to-day; but must be designed for the particular class of work they are to be used on, since their wave range is limited. Those on the market are meant in most cases, to have a wave range from 150 to 500 meters, and will work most efficiently at about 350 meters—their natural wave length.

The last named system, the tuned plate, is, if well constructed and operated, the best of all for short-wave amateur work, but has the disadvantage of being difficult to tune. In fact, tun-

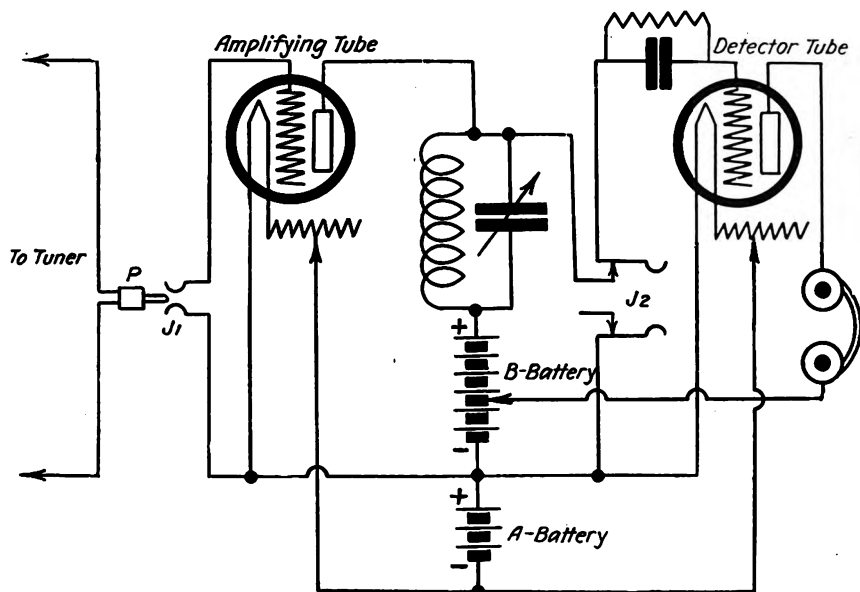
ing becomes well-nigh impossible if several steps are used. In this system, a variometer, or a variable condenser and a tapped inductance, serve to tune the plate circuit to resonance with the grid circuit and the incoming signal. Such an amplifier greatly increases the selectivity of a set.

The value of short leads cannot be overestimated. Important in all radio work, it means the difference between success and failure in working with amplification on the enormously high frequency of short wave-lengths. All wiring should be done with No. 14, bare, copper wire with all joints soldered. Parallel leads of plate angle

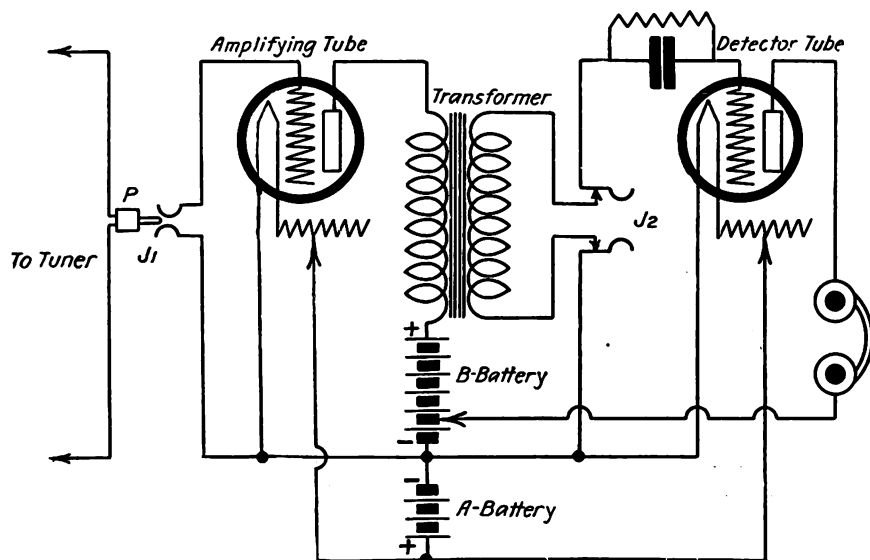
grid circuits should be carefully avoided. When using a tuned plate circuit amplifier great care should be taken to keep the plate inductance away from the grid or tuning inductance; otherwise, a feed-back which cannot be controlled will result.

Where a great number of steps of high-frequency amplification are used, the tubes should be shielded from one another by grounded metal partitions, and the back of the panel should be covered by tin foil, grounded.

In selecting a tube for use in radio-frequency amplification, care should be exercised. A very hard tube will give the greatest freedom from distortion.



Schematic diagram of a two-tube circuit showing the difference in the coupling between amplifier and detector. Suggested by Harold S. Potter. Drawn by S. Newman.



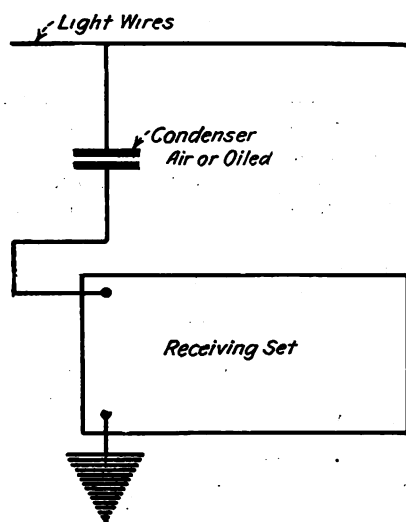
Schematic diagram showing the amplifier and detector with radio-frequency transformer. P is a plug from the tuning circuit, J-1 the jack of the amplifier. Suggested by Harold S. Potter. Drawn by S. Newman.

I have found a Meyers tube very satisfactory, while an A. P., is almost as good. If neither of these tubes can be procured a radiotron U-V 201, or a Cunningham amplifier tube, may be used with satisfactory results; but the current consumption of the two last named is high, making them less economical to use.

The proper regulation of the filament current of the amplifier tubes, especially the first arc, is of vast importance in the operation of a radio-frequency amplifier. While experimenting with a one-step tuned-plate amplifier using an A. P. amplifier tube, coupled to an audiotron detector tube, I found that a most careful adjustment of the amplifier-tube filament was necessary, while the audiotron detector filament, the adjustment of which was very critical in an ordinary one-tube circuit, needed very little adjustment.

How to Connect the Electric-Light Socket Aerial

By John Kent



Schematic diagram of the lamp-socket aerial. One wire only is used in the circuit. The condenser is connected between the aerial post of the receiver and the electric light wires. Drawn by S. Newman.

THERE is considerable unrest among amateurs who are still dabbling with their receivers trying to hear concerts by utilizing electric light power-lines as an aerial—that is, the wires or lamp-socket connections in the home used for light-

ing purposes, running vacuum cleaners, ironing, or other domestic matters. Major-General George O. Squier, of the United States Signal Corps, started many amateurs on this track when he announced its possibility, last spring.

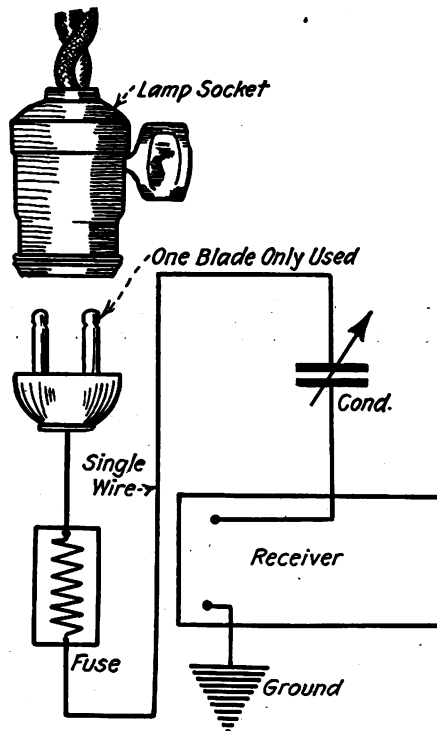
There is a lot yet to learn about operating an electric-light aerial. When using the socket, a few simple precautions must be taken in order that no trouble shall arise such as the burning out of tubes and probably no signals being received. The accompanying illustrations indicate how the set should be connected. Figure 1 is a schematic diagram of the lamp-socket aerial. Figure 2 shows the proper connections.

One factor is necessary—a good plug. The plug must be absolutely perfect, electrically. Usually, an ordinary attachment-plug is used; one with two blades, connecting the separated halves of the plug. One wire is all that is necessary; the other being left undisturbed.

The single wire used should be long enough to reach from the lamp-socket

to the table where the instrument is to be used. It can be seen by the diagram that a condenser is used. This is essential for two reasons: First, to keep the current of 110 volts from your instruments; second, to effectively reduce the wave-length of the lighting wires, which are exceptionally long, so that it is possible to carry the shorter wave-lengths from the antennae.

No set should ever be used on this system without employing condensers with the aerial or ground circuit—the



Schematic diagram showing the lamp-socket and plug. This is so simple that most any radio amateur can perform the operation. Do not fail to use the condenser in series with wires. Drawn by S. Newman.

(Continued from preceding page)

I was using 45 volts on the amplifier and 19½ volts on the detector.

The use of very high-plate voltages in a radio-frequency amplifier should be avoided, as no great increase in signal strength results, and the life of the tube is considerably shortened.

One of the things which stands in the way of most amateurs using radio-frequency amplification is the difficulty of using the desired number of steps, and cutting out those not necessary. To do this in one operation, some amateurs have adopted complicated switches; but these are expensive and inefficient, due to losses from capacity effect. Therefore, we must turn to the old reliable jacks.

A plug and jacks cannot be used, as in an audio-frequency circuit, to place the phones in the plate circuit of any tube at will, since the unrectified plate current of the radio-frequency amplifiers would produce no sound in the phones. The problem now resolves itself into keeping the phones in the plate circuit of the last tube, and varying the number of amplifier tubes between the detector and the tuner.

This may be accomplished by placing

the jacks in the input circuit of the tubes, and connecting the plug to the tuner output. Figure 1 shows how this may be done in a transformer-coupled amplifier, using either air- or iron-core transformers. Figure 2 shows how jacks may be applied to a tuned plate circuit amplifier. J1 in each case is a single-circuit jack, and J2 a double-circuit. In each case a single A and a single B battery is used. In the second diagram it will be noticed that but one inside contact arm of J2 is used.

Although but one step of amplification is shown in each case, any number of steps may be added in the same manner. All the jacks will then be double circuit except J1, which will always be a single-circuit jack of the open circuit type.

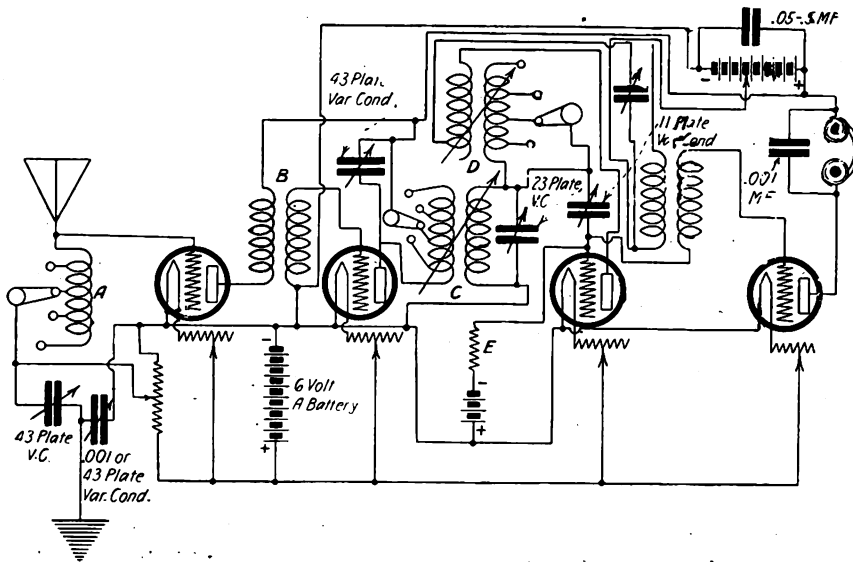
To minimize losses, the jacks should be so located that short, direct wiring may be used. The plug is connected by a flexible telephone cord to the tuner. All inside connections to the jacks should be carefully soldered, using resin as a flux, and pure metal solder. The use of special soldering compounds, which constitute flux and solder in one, should be carefully avoided, as they are apt to cause corrosion.

aerial circuit being preferred. Another hint to the amateur: Insert between plug and condenser, as shown in diagram, a one-half-ampere fuse which will benefit and protect the set.

When using the set, simply screw the attachment plug into the electric-light socket and start tuning as usual. If no results or poor results, should be experienced, simply reverse the bottom half of the plug. Amateurs endeavoring to use the lighting system as aerial should never hook-up direct to a lighting system without employing a means of safety, such as a condenser. Where no condenser is used, the fuses probably will blow out and leave the house in total darkness. Precautions should be taken so that no body contacts are made with power lines and the ground at the same time.

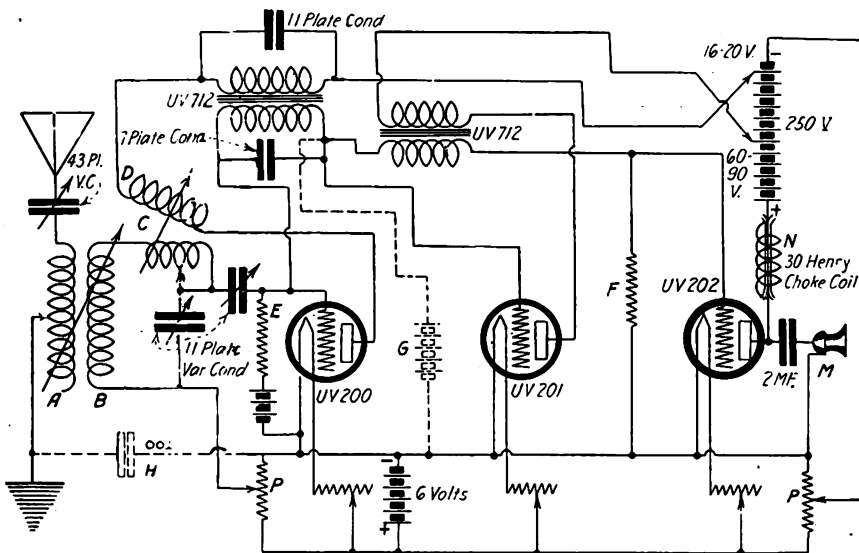
Practical Circuits for Regenerating Loud Signals

By O. S. Kelly



Schematic diagram showing circuit employing radio-frequency. A is the loading coil. B, any standard radio-frequency transformer. C-D are variocouplers. E is a variable grid leak from

$1\frac{1}{2}$ to 3 volts bias. As many stages of radio-frequency and audio-frequency may be added as the builder cares to use. Suggested by Dr. O. S. Kelly. Drawn by S. Newman.



Another schematic diagram of Dr. Kelly's practical circuit, employing the following apparatus: A-B is a vario-coupler; C-D is also a vario-coupler having a wave length from 180 to 600 meters. The tickler is wound with 125 turns of wire (bank wound). E is a variable grid-leak,

$1\frac{1}{2}$ to 3 volt bias. F is a fixed grid-leak of about 1 megohm. G-H shows optional connections, the grid bias being from 6 to $22\frac{1}{2}$ volts. M is a loud speaker. N is a door-bell transformer (primary open) using 110 volts as choke. Suggested by Dr. O. S. Kelly. Drawn by S. Newman.

I DO not claim anything new regarding this circuit. In fact, it is the principle of Major Edwin H. Armstrong's invention. Inasmuch as it uses different methods, the principle is the same. Accompanying this are two schematic sketches of a circuit I have used through the terrific static we have in this section (Oklahoma City, Oklahoma). While it embraces the same principles, it is stable and may be operated by the average amateur without difficulty. This hook-up is available

for use with a regenerative set, and is more a matter of the correct use of the regular equipment and its proper adjustment than of special coils and critical behavior.

In tuning this circuit the grid leak is the key to the entire circuit; therefore, an adjustable pencil mark, or variable grid leak, is absolutely essential. I use VT 1 for the detector, and either VT 2 or UV 201 for the amplifier; but VT 2 for the last stage makes things whizz. In the radio-frequency

circuit, UV 201 amplifying tube is used exclusively. The regeneration is carried out exactly as in the simple regenerative set.

When adjusting the operating stage of highest amplification and disturbance elimination, first set the condenser on the primary and secondary stage of the transformer and the tickler coil until the set howls violently. Lower the the grid-leak resistance until the oscillations practically cease and a high whistle-like noise is heard in the plate circuit of the second tube. The condensers may then be set on proper wave length and tickler rotated to the maximum of signal audibility.

This circuit is not easily paralyzed. The grid-leak condenser is the only instrument that will require a shield; for, while no hiss or howl is heard when in operation, the variable grid condenser sharpens tuning and eliminates interference to a marvelous degree. The following stations are heard: QSA (both telephone receivers and magnavox), KFAF, KSD, KNJ, KYW, WAAL, WDAF, WEAH, WFAV, WBL, WGAQ, WRR, WHB and many amateurs on CW in the Fifth District.

Watch for This

DOES this ever occur at nighttime: Signals from distant stations "swinging" badly, or varying in intensity, then gradually becoming weaker and even fading out entirely, then reappearing with varying intensity? This phenomenon is known as "fading" or "swinging of signals," and is believed to be due to certain conditions of the atmosphere. Stations within reliable daylight range are seldom observed to fade appreciably. If signals from various broadcasting stations appear to swing or fade simultaneously, the receiving set should be examined. The cause is due, frequently, to an exhausted filament or plate battery. An irregular hissing or frying noise is frequently another indication of an exhausted B battery.

Radio Telephone Range Tests

THE Bureau of Standards is planning to conduct comprehensive tests to determine the effective working ranges of radiotelephone communication when using various kinds of transmitting and receiving sets. Preliminary plans have been outlined for this work, and some correspondence conducted in regard to it.

World Commerce Aided by Radio's Far-Reaching Weather Survey

By Carl Hawes Butman

WASHINGTON, D. C. — On August 16, there came to the United States Weather Bureau a radio message composed of curious code words and figures, which would mean nothing to the average fan but which mean much to the forecasters of the weather. It was the first daily European meteorological report from France, forwarded in exchange for a report on conditions in North America sent daily by the United States Weather Bureau since June 15.

Radio has taken a vital part in gathering and disseminating meteorological data for some time, especially in the United States, where the science is farther advanced and the speed of transmission higher than in any other country. Now radio has begun to serve the Old World with news from the New. Early in June, arrangements were made between Captain Wehrle of the French Meteorological Service and American Weather Bureau officials for the exchange of meteorological observations from about thirty main stations in the United States and Canada, and a similar report from 22 European stations—the exchange to be made daily by radio. Beginning on August 16, the United States Weather Bureau incorporated the French report in its daily statements which are broadcast from some 80 stations throughout this country.

In France, a daily broadcast from the Eiffel Tower now carries the American weather report to all radio stations within its range in Western Europe. Weather reports from the West are especially valuable to Europe, where meteorology is international, the weather in one country materially affecting that in another. As the course of most storms, as well as what are termed "highs" and "lows" of barometric pressure, is generally from west toward the east, European countries are vitally interested in the weather in North America to-day, since it will affect their country within a few days; storms and cyclones on our two coasts eventually reaching Northern Europe. By means of the newly arranged radio exchange, France collects the information from 22 European stations and sends a composite report from the Lyons station to our Naval station at Bar Harbor. The United States Government collects its local data and transmits a general survey every evening from Arlington to Bordeaux, so that it reaches its destination before

the Europeans are awake on the next day, and gives news of a storm long before it arrives.

The development of the science of meteorology in the United States has been remarkably fine and its establishment dates back fifty years, when, with the aid of line telegraph, reports were received from as far west as the Great Plains. To-day, there are 210 weather-bureau stations in the United States and 30 in Canada, all of which cooperate in gathering weather statistics. Observations are taken twice daily, at 8 a. m. and 8 p. m. (75th meridian time,) but it requires a full hour and many telegraph lines to distribute all the information to Washington and 125 other weather-bureau offices, where the observations are charted and released to the public. Observations of the barometer, state of weather, wind velocity and direction are taken. When the reports are all received at Washington, the forecasting is done and the information disseminated.

Besides the stations in the United States and Europe, Washington gets advices from 36 stations in the West Indies, Cuba and Central America; 17 points in Mexico; 12 points in the Pacific, and 9 in Alaska; making a total of 336 reports including the United States and Canadian observations.

Radio serves many of the collecting and transmitting stations; for example, all European reports come in by that means, as well as 16 of the 36 West Indian reports, 12 from the Pacific and Far Eastern Stations, and 4

of the Alaskan stations. "Wireless" was first tried experimentally in 1900, and much progress was made by the Weather Bureau, the first of the Government departments to use it; but, in 1904, President Roosevelt's radio board recommended that the Bureau cease its experiments, assigning development work to the Army and Navy.

Radio reports from the Far East have the curious effect of reaching San Francisco before they start, due to the difference in time; messages sent at 8 a. m., standard eastern time in Japan, reach San Francisco at 5 a. m., three hours earlier, and Washington at 11 a. m.; but it is really about 12 hours after the observations are taken before they reach headquarters.

Officials of the Weather Bureau point out that radio has aided in the advance of the science of meteorology more than anything else in the past two decades, and they expect it to accomplish much more in the next few years. It serves especially in collecting weather data from vessels at sea, as well as making possible the sending of storm warnings and forecasts to the ships. Previous to the use of radio on the sea, no information of approaching storms was available. To-day practically every ship sends a full weather report twice daily, all of which are forwarded either to San Francisco or Washington.

The Navy cooperates in both collecting and disseminating this information, and broadcasts a weather report twice daily from Arlington, San Francisco, and the Great Lakes. Local services are broadcast daily by 36 Naval radio-stations on American coasts, primarily for ships.

Weather forecasts and warnings are sent by land telephone to approximately seven million telephone subscribers in this country, which is particularly valuable in the rural districts, but the latest and most complete service—thanks to broadcasting stations in all but one State—makes the weather reports available to nearly a million people who have radio-receiving sets, among them many isolated farmers who never before had the benefit of weather reports.

In the future, forecasters look for data from the most remote places sent by explorers via radio. Amundsen, who is sending reports from the Far North, almost daily, is the first to do this. It is a step toward an improved and complete weather survey of the World.

Radio Waves of Radium

By Harold Day

THE shortest X-rays now known are about one-tenth of a unit long. But there is still the shorter rays and the gamma rays given out by radium. These rays have, apparently, wavelengths of from .05 to .08 unit. They are the latest form of radiation to be discovered. As yet not much is known of them. But they are, like all the others, waves in the ether, just like the X-rays and light and radiant heat and wireless, except that they are shorter. They are the radio of the radium atom, the ethereal cry which goes out from the atom when it suffers the atomic explosion that causes radio activity.

The Radio Primer

A Weekly A. B. C. of Radio for the Beginner, in which Elementary Facts and Principles Are Fully and Tersely Explained and all Words and Terms Used by Amateurs and Experts Defined

The Beginner's Catechism

By Edward Linwood

CAN body effects be eliminated when using the variometer-type set? How far should they be spaced?

Body capacity-effects may be eliminated if the back of the panel is sheeted with thin copper and grounded. Copper sheeting also could be placed between the variometers, care being taken that the sheeting does not come in contact with any of the wires. The variometers should be spaced about four inches apart.

* * *

Of what use is the variable condenser in shunt to the secondary? Does this help the set any?

The variable condenser in shunt to the secondary of the loose, or vario-coupler of the receiver, serves to add capacity to the circuit and permits a finer degree of tuning in the secondary circuit than could be obtained merely by varying the value of the inductance of the secondary.

* * *

Can a vario-coupler or a variometer be made by an amateur?

A vario-coupler for short waves may be constructed of about 80 turns of No. 22 double cotton-covered wire wound on a tube four inches in diameter. This is called the primary, or stator. The next, or the rotor, may be either ball or tube type, and should

be wound with 50 feet of the same size wire. The primary winding should be tapped, each turn, for the first 8 turns, and these turns connected to a switch. The succeeding turns should be tapped off in groups of 8, each attached to another switch. The variometer may be made in four sections, forming two coils each and comprising two windings. The stator winding should have about 25 turns on each section, and the rotor winding the same. Use No. 22 wire.

* * *

How may a test be made to discover if a variable condenser is short-circuited?

An arrangement so built that a buzzer and battery, connected in series with the condenser, would tell if any part of the condenser is short-circuited.

* * *

What is a tuning coil?

A tuning coil is a length of wire wound around an insulated tube. The wire is copper, and ranges in size from No. 16 to No. 32, B. & S. The length of the wire depends on the number of turns required and the diameter of the coil. The tube may be made of pasteboard, fiber, bakelite, formica, or any other patented composition materials. Metal tubes should never be used. The diameter is from $3\frac{1}{2}$ to 5 inches.

length of any circuit in which it may be used. When the coils are turned about so that the current flow in both sets of coils is in opposite directions, the coils are said to be bucking each other and the inductance and wave length at a minimum.

Vario-coupler—A tuning coil, or set of coils, that will tune the same as that of a loose coupler. Very efficient in a set using a vacuum tube if connected with a regenerative set.

Variable resistance—A device for regulating a current flowing in a circuit, as water resistance in the primary circuit or a potentiometer in the receiving circuit.

Valve amplifier—A three-electrode vacuum-valve tube of the audion type. Used either to amplify the incoming radio signals after rectification. Both rectification and magnification may be performed by the same tube.

Volt—The unit of electrical pressure. It is pressure that forces one ampere through a resistance of one ohm.

Watt—The unit of electrical power. To find power in watts, multiply voltage by amperage. Seven hundred forty-six watts equal one horse-power. One thousand watts equals one kilowatt (kw).

Wave changer—A switch by means of which the wave of a transmitter may be changed from one wave to another.

Wave length—The distance between the crests of each wave or series of wave trains measured usually in meters. Radio waves in their passage through the ether, travel in undulating form similar to waves at a seashore.

Wave-train frequency—The number of wave trains radiated per second by a transmitter antenna.

Wave meter—An instrument used for measuring the wave lengths of radio transmitters and receivers.

Wireless key—A device for making and breaking up a current into dots and dashes. A key for wireless work usually has larger contact than an ordinary telegraph key.

Wireless waves—Electric waves. The waves sent out through space by oscillating currents in an aerial wire.

Zincite—A deep red mineral used in connection with crystal detectors as a sensitive element. Zincite is very sensitive to electrical oscillations.

Radio World's Revised Radio Dictionary

By Fred. Chas. Ehlert

Tune In—To tune a receiver to the desired transmitting station, in order to receive the loudest signals.

Tune Out—To tune a receiving set so that the signals of all stations not wanted are weakest.

Tuned Closed Circuit—A circuit formed of a condenser, spark gap, and inductance for transmitter. Also, a circuit formed of a condenser, inductance, and a detector.

Tuning—The act of altering the capacity, or inductance, of a circuit so as to bring the circuit into resonance with an external source of similar character.

Undamped—A train of high-frequency oscillations of constant amplitude. Such waves are termed CW, or continuous waves.

Vacuum tube—(Abbreviated VT.) A form of detector making use of the elec-

tronic theory. The most efficient form of detector. In radio work, this term is applied to a glass tube exhausted of air and containing essentially a filament—for the creation of electrons. The vacuum tube plays three leading functions in radio work; namely, detection, amplification, and generation of high-frequency electromagnetic waves.

Variable condenser—An instrument that consists of a number of aluminum plates, one-half of which are stationary and the other half movable. It is used to vary the capacity of the receiver and will greatly aid tuning.

Variometer—Consists of a set of fixed windings and a set of movable windings, the latter being rotated on twin axes in the usual construction. This instrument serves to vary the inductance and wave-

For Sensitive Reception

USING a fixed condenser across the telephones will have the effect of taking the weak impulses which have been rectified by the detector and storing them up in the condenser until the condenser is fully charged. It will then discharge the signals more evenly.

A variable condenser is an essential element for sensitive reception. In general variable condensers afford a reliable and simple method of altering the values of receiving circuits in order to bring about a point of resonance, thus enabling one to select at will stations on different wave lengths.

Radio World's Hall of Fame



(C. Underwood & Underwood, N. Y.)

ELMER E. BUCHER

One of the youngest and most active men in radio. He is thirty-seven years old and has written several of the most practical books published on radio, also a number of important magazine articles. After being graduated from Oberlin Academy, Ohio, he joined the De Forest Wireless Telegraph Company as experimental engineer. To spread the gospel of radio, he became associated with the Y. M. C. A., and started a number of branch schools. Many people thought he was too far ahead of the times by doing this, but he had hundreds of young men prepared for positions when radio finally "arrived." In 1912, he became instructing engineer for the Marconi Wireless Telegraph Company. Mr.

Bucher is now connected with the Radio Corporation of America.

Cleveland Bank Becomes Broadcaster to Increase Its Business

By H. K. Keyes

THE Union Trust Company, Cleveland, has installed one of the most complete broadcasting stations in the Middle West. It will have a range from 500 to 1,000 miles. This is the second broadcasting station in Cleveland. The antenna is 350 feet above the level of the street and is believed to be the highest in Northern Ohio. It is heavy copper cable. The station uses four 250-watt tubes and one 100-watt voice amplifier. Power is furnished by a five-kw. generator. There is, also, a two-stage speech amplifier. Stock market reports, live stock, grain and produce reports are broadcast every day at 9 a. m., 10 a. m., 2 p. m., and 3 p. m. It is planned to give concerts at least once a week. J. M. Thornburn will be the expert in charge. He formerly was in radio work with the Ford Motor Co., Detroit, the Detroit Edison Co.

A. E. Scoville, vice-president of the Union Trust Company, says that radio broadcasting is unquestionably in its infancy.

"The average man," says Mr. Scoville, "looks upon it as an easy means of listening to concerts, etc.

"For more than a year we have been watching radio broadcasting closely, contemplating its service possibilities with increasing interest and respect and awaiting the time when radio broadcasting and receiving could be said to have 'arrived.' To-day, at the Union Trust, we believe that, in radio, there is a tremendous potential use and in establishing our new broadcasting station we are going to attempt to demonstrate that radio broadcasting is an important cog in the industrial machinery of the country.

"I really feel that our broadcasting in its importance is second only to the introduction of rural free delivery for the farmer, and I make that statement advisedly, because through our radio broadcasting we will place the farmer in the position of a man with a private bond ticker in his office.

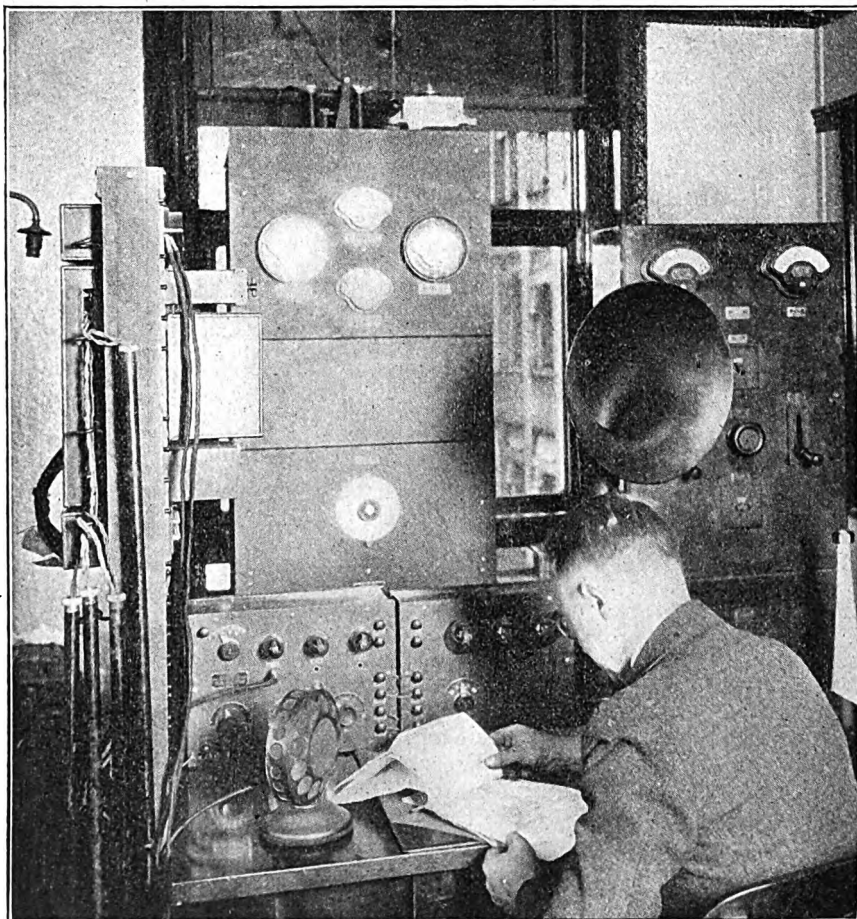
"Let me explain: Hundreds upon hundreds of farmers within the broad radius covered by our radio broadcasting already have receiving sets in their homes. Practically all of the banks of

the Fourth Federal Reserve District will shortly include radio receiving sets as a part of their equipment. Four times a day we will broadcast the very latest prices upon farm and dairy products, with the results that the farmer, either through his own private receiving set or through his local banker, can obtain up-to-the-minute data upon the prices of farm and dairy products.

"In no lesser degree will our broadcasting be of benefit to the banker within a radius of four or five hundred miles, because the first thing in the morning and again early in the afternoon for a period of an hour and a half each, we will broadcast not only the interesting details and fluctuations of the bond markets, the government bond market, but the vast fund of information which accumulates so rapidly within a modern financial institution. This will, in effect, give every banker who has a receiving set the benefit of the vast machinery of the Union Trust Company an informative service which we find well worth a cost of \$50,000 or more a year.

"In short, instead of regarding the radio as a toy, we conceive it as a tremendous help to thousands of banks and their customers. We look upon it as a means of knitting the Fourth Federal Reserve District, with all its banks and all its people, together into a compact whole, thoroughly informed at all times of the major news of the financial world. More and more are profits in business becoming a matter of seconds. Fluctuations and tendencies are comparatively violent and it is imperative that the business man not only in the city, but the modern business farmer, be in intimate contact with market tendencies and conditions.

"The stimulation of business which will inevitably result is self-evident, for only through an intimate knowledge of the situation can the modern business man and banker operate the economies and plans upon which business profits of today so largely depends. As a means toward this we are erecting what is the very last word in radio-broadcasting outfits. It incorporates every practical and beneficial improvement known to the science and art of broadcasting as it is to-day. To my knowledge we are the only bank in the country with its own private broadcasting station, and this will mean the vast fund of information and data now now being used by comparatively few individuals will be placed at the command of a wide circle, thereby multiplying the benefits of the modern bank many thousand fold."



A corner of the broadcasting room of the Union Trust Company, Cleveland, Ohio. A. E. Scoville, vice-president of this institution, explains in an interview on this page why radio is so necessary to successful banking.

United States Army to Be Enforced with Radio Tanks

By Washington R. Service

RADIO experts of the United States Corps have just perfected a new tube transmitting and receiving set for the "baby," or "whippet" tanks which will handle both telegraph and telephone messages. So successful was the recent demonstration at Camp Meade with the radio-directed tank which took part in the fight of "Hill 285," leading and directing its brother tanks, that from 30 to 40 new sets have been ordered for the master tanks of the Army.

The specifications of the new tank equipment, known as S.C.R., 143, dual telephone-and-telegraph set, call for a strong and compact set of about 50 watts, which will withstand the jolting of a tank in action over rough terrain and preserve a good tone. It will have a range of from five to ten miles.

Plans of the infantry arm of the service, which includes the old Tank Corps, provide for one radio, or "signal," tank for each group of whippet tanks, which will serve as a message and control center for the group. The signal tank will be equipped with a six-foot aerial, the ground being the tank itself. Power for driving a small generator will be derived from storage batteries. A sound-proof helmet with phones such as air-pilots use, will be supplied for the radio man so he may hear despite the rattle of the mechanism and roar of the engine.

The first practical demonstration showed the value of radio-equipped tanks. They are not radio controlled, but radio directed. Captain C. H. St. Germain, signal officer of the tank school at Camp Meade, took his station on one side of the maneuvering ground, after the recent sham battle, and, with his head-set on and a transmitter in his hand, made the mechanical scout several hundred yards away go through its paces to perfection. At his radio orders, it "charged" the hill, executed "By the left flank," "To the rear" and "halt" performing most creditably, directed solely by radio, which might have been several miles away. In actual battle, however, the tank commander would attend to all details as to moving about, relying on battalion or regimental headquarters for such information as when to advance or retreat and where machine-gun nests were located. Such information would be conveyed to the other tanks in the group by visual signals or the movements of the master tank itself, just as in air-plane formations.

Future development is seen in the

equipment of all tanks with receiving sets, so that intertank communication may be had in action, and some prophetic spirits of the corps foretell of radio control enabling an "Amatol," or "T. N. T." filled tank to be sent into enemy lines and exploded, a "creeping

torpedo," in fact, which would undoubtedly carry fear and destruction into the enemy camp. But that is a subject for future development, although quite possible electrically and mechanically. It is not being side-tracked by the United States Army.

"It Is Simply GREAT!" said Marconi



(C. Central News)

The "Wizard of Wireless" had just returned from a tour of inspection of the vast radio center at Rocky Point, Long Island. He was visibly impressed with the far-flung antenna, the massive generators, the huge receiving sets ready to pick up signals from the ends of the world. Then he remarked with pride: "It's simply GREAT!"

Radiograms

Latest Important News of Radio Garnered from the World Over, and Reduced to Short Wave-Lengths for the Busy Reader.

PASSENGERS aboard the flying boat, "Buckeye," of the Aeromarine Airways, Inc., were entertained by radio during the ninety minutes' journey from Detroit to Cleveland recently. The entertainment was supplied by "aerial stowaways" who made the trip by proxy—by radiotelephony. The radio equipment, weighing 150 pounds, was placed in the large stern-cabin of the boat. While the noise of the "Buckeye's" motors prevented the passengers from hearing clearly the program of the "stowaways" was greatly enjoyed. This the company intends to overcome with an ample loud-speaker.

The majority of the 1300 boys and girls of the Hebrew Orphan Asylum, 136th Street and Amsterdam Avenue, New York City, are radio fans. Classes of a dozen or more may be seen daily "listening in" at the receiving sets. International news and sporting events are the chief topics of interest to the young enthusiasts.

The Canadian public is looking to radio for much of its entertainment. Several theatres in Toronto and throughout the province of Ontario, have installed radio receiving sets in their buildings for the purpose of giving radio concerts each evening. They have secured the services of a number of artists who will perform in the Marconi Company's large new broadcasting station on the roof of the Canada Cement Building, Toronto.

The history-crowned Red Sea—1450 miles long, between Arabia and Africa, and one of the hottest places on the globe—is said to be the most pronounced radio "dead spot." Radio operators claim that while passing through this inland body of water, they can read no signals. Even the station at Aden, Arabia, is silent. But on leaving the Red Sea, messages are picked up at full length.

John F. Hylan, mayor of New York, is an ardent radio fan. He owns a muchly used receiving set. Perhaps that is why he is deeply interested in New York City's new municipal broadcasting station. In regard to this station, the mayor believes that broadcasting will be of real service to the various city departments, particularly the police, fire, and health departments. To the police, asserts Mr. Hylan, the radio will render a two-fold service. It will enable them to enlist the aid of many thousands almost instantly in an important crime hunt, instead of passing the warning to merely a few thousand members of the force.

A new radio record from Buenos Aires, Argentina, is reported by the Chicago "Tribune." the steamer "Almanzora" on its arrival there reported exchanges of messages with Cape Town, South Africa, at a distance of 3,457 miles; and with Leafield, England, 5,534-miles distant.

Radio is developing several new "professions," among the most important being that of the line-up man who repairs housetop aerials.

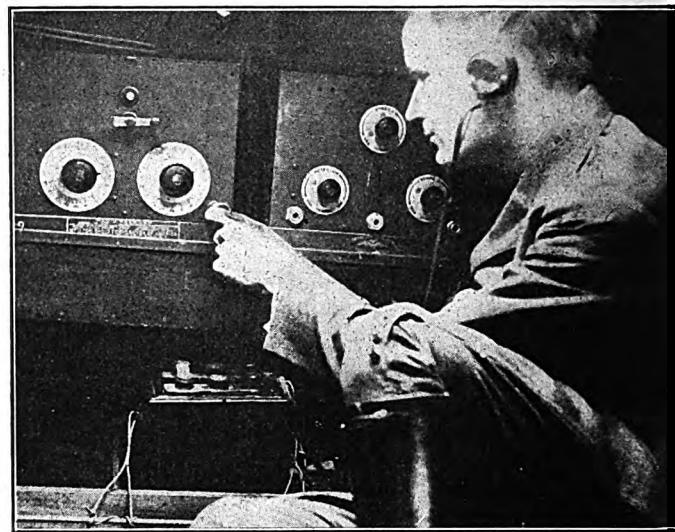
The effect radio will have on the literary style of the future may be analyzed in a measure by watching the development of



WIRELESS IN THE HOME

Harassed Parent: "Good heavens! I suppose I must have switched the little beggar on to that political meeting at Limehouse instead of the lullaby concert at the Linoleum Hall." —From London Opinion.

Radio Set Aboard the "Sampaio Correio"



(C. International Newsreel Photo)

The big Brazilian seaplane, piloted by Lieutenant Walter Hinton, U. S. N., was fully equipped with a radio set prior to her long voyage. The photograph shows the operator tuning in just prior to flight from New York. The receiver is a General Electric set donated by the Radio Corporation of America.

the short stories and tales broadcast by the authors of juvenile books. Natural history, thinly coated, is absorbed liberally by the children. By the same token, selections from the tales of Hans Christian Andersen and Uncle Remus, although they are recited by announcers only, appeal to the heart of youth.

He proposed by radio, and the girl said, "Yes!" And when the liner "President Monroe" sailed for France, last week, Maurice G. St. Germain, an officer of the Paris branch of the Guaranty Trust Company, and his bride, formerly Miss Loretta Harvey, of 281 West 118th Street, New York City, started on their honeymoon. Mr. St. Germain, who had courted Miss Harvey for two years, proposed marriage by radio as he was arriving on the "Mauretania" last week. Miss Harvey accepted him and they were married. Cupid finds radio a willing ally.

Two of the motorcycle members of the police force of Santa Monica, California, have installed equipment for the entertainment of the officers at headquarters in their spare moments. It is expected that it will prove to be a practical adjunct in receiving clues and running down criminals. A wire L flat-top aerial, eighteen feet high, has been erected on top of the Santa Monica City Hall, with detector and two-step amplifiers.

Colorado is planning to have a comprehensive system of radio communication, which is now being evolved by the police and military authorities. Every sheriff's office is to be equipped to listen in under a regular schedule, and word of escaping criminals or fugitives from justice will be broadcast.

The American Code Company has issued a system simplifying the Morse Code for amateurs. The set consists of easy memory-words formed from the component parts of their letters. As a means of assistance to the beginner, two gramophone records which reproduce exactly the various Morse signals, as they should be in the receiver, are used.

Radiotelephony has been applied to the motor-car. The first experiment of this kind was made on a car equipped with a three-tube amplifying apparatus, which gave street-corner concerts and provided other forms of entertainment. Inter-car radiotelephone communication is simple to carry on, provided the apparatus is sufficiently rugged to withstand travel.

Radio and the Woman By Crystal D. Tector

I HAVE never boasted prophetic vision; but, as a student of things feminine, I believe that radio will be the prevailing fad with the fair sex this winter. There is an old saying: "Woman's personality is revealed by her clothes." This year—when we have settled down to the things that make winter a long spell of pleasure—it may be changed to "Woman's personality is revealed by her radio set."

I say this without trepidation. I have chatted with my sister-radioists and non-radioists—and what I write seems to be overly possible. And, why not? Radio is just one vast fun-producing pastime. There is fun even in the more educational numbers of the programs; for, according to that sage of ancient days, Epictetus, we get joy out of all things that broaden and enlighten our minds—and joy is but the outcome of all fun.

Many of my friends have asked their husbands, already, to give them receiving sets for Christmas. Several young matrons of my immediate acquaintance have told me that they are to have these Christmas presents installed at once, and not wait for the night when they hang up their stockings to come. "Why miss all that is going on till then?" as one tersely asked. "And I promised my little husband," said another, "that I positively—positively—would not ask for anything else for Christmas if he would put in a radio set now."

And several women are planning radio parties. Radio dances are to be part of the scheme of things. Radio dinners will figure prominently in the society news. In short, as I see things shaping socially for the coming season, if you want to be in the swim, in all that term implies, you must become a radio fan. It looks to me as if the home without a radio set, this winter will be like one without some music-producing article. You know, my gentle audience, play is a

very important factor in our lives. We must take time out to enjoy ourselves—and as one of the first women to take an interest in radio, as one of the first to see its possibilities and go deep into it, I am convinced that radio contributes to life more genuine fun—at least, to me it does—than any other thing I know of.

Now I am studying code. I find that it has tremendous possibilities for the amateur. I will tell you more about it later. Friend Husband says that he does not care how far I go so long as I don't become a genuine "night owl." Those, you know, are the real bugs who find radio reception so fascinating that they sit up till very late—some of them even sit up all night, I am told—waiting to pick up some far away station and get some mysterious message out of the ether.

This is one of the most fascinating things in the world. Really it is more fascinating than bridge or golf or any other hobby. And it is as romantic and mysterious as it is fascinating. It "gets you" if anything does. I am told by an old "night owl" that he has frequently stayed up till dawn, sending the dots and dashes to a "friend" a thousand miles away—a friend he has never seen—and waiting for that friend to send an answer—they have wonderful conversations. Imagine when half the people of the United States will be conversing with one another by radio!

It seems evident that if radio is to be used for advertising purposes, all the good work that has been accomplished in providing pleasant entertainment and giving valuable information will be destroyed. Advertising would go directly into the home and invade domestic privacy. Realizing that her home should be free from commercial cares, Mrs. Average Citizen won't relish what the butcher, the baker, and the rest are announcing about their wares.

How One Mother Found a Way to Amuse Her Baby



(C. Central News)

This photograph speaks for itself. Radio has been put to use in thousands of homes for certain purposes. Entertainments and concerts are broadcast, as well as weather and crop reports, and other information. Here a mother has taken the ear-pieces, which permit one to listen to what the waves are saying, and has placed them on her baby's head. According to the photograph, a good musical concert must be "coming through." We all agree that the baby does not really understand what it is, nor what is going on, but it proves that a baby realizes it is something pleasant. Many an amateur has provided means whereby the children could listen to the concerts as well as the operator. To the left of the baby is the back view of the receiver used with its necessary equipment.

of the Week

Radio Photograms



(Left) The younger generation made radio popular, and the younger generation will continue to do its share to keep radio popular. Did you ever talk to a crowd of youngsters who have the real radio enthusiasm—boys like those in the photograph who find it just the thing to fill in an evening at home? It is marvelous—their complete understanding. They seem to take to it, and to enjoy its educational advantages more keenly than any other thing that has become an integral part of boy life.



(Berbert News Service)

bill of the canary. And not only the one canary but a number of canaries is broadcasted, for Hazlett, of Berkeley, has obtained a number of trained singing birds, and that concert is a sensation when it is given in Oakland. Owing to the tones of the birds, radio fans with their ears unable to pick up the exceptionally fine tunes in this case, seemed to give the

(Right) With the Stars and Stripes and the Union Jack fluttering on either side, the grave of the late Alexander Graham Bell, inventor of the telephone, on Beinn Breagh Mountain, Baddeck, Nova Scotia, promises to become a point of interest to future generations. Dr. Bell's great invention was a step toward the discovery of radio; therefore, he will always be revered by the radiotrician. There was no doubt in his mind that radio would some day supplement the telephone—that the great trinity of communication would be the telephone, the telegraph, and radio.



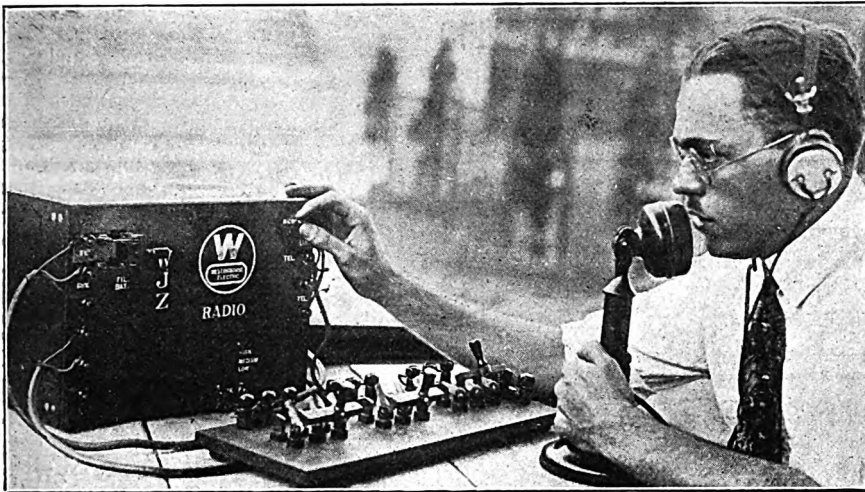
(C. Underwood & Underwood, N. Y.)

(Above) Radio is to be utilized by the United States Post Office in connection with the fast planes that carry the mails by night. These planes will be directed over their routes by radio. Experiments are producing such satisfactory results at Bolling Field, Washington, D. C., that it is evident this important and speedy branch of the service will be increased in value to the public and in safety to itself over a hundred per cent.



(C. Underwood & Underwood, N. Y.)

Broadcasting a Symphony Concert by Telephone



(C. Kadel & Herbert News Photo)

By a special radio, installed at the stadium of the College of the City of New York, the open-air philharmonic concerts have been broadcast over an area covered by 75,000,000 people. Never before has a great symphony orchestra had its music broadcast. The music is recorded by a special type of microphones. This device (shown in the column-width photograph below), in appearance is a small black cylinder, 4 inches long and 4 inches in diameter, suspended in view of the audience at an elevation of about 25 feet. It is supplemented by a second microphone located just above the orchestra leader's platform for the purpose of recording a soloist. These microphones convert the music—as well as the applause that follows—into electric currents of strength and character of sound waves that impinge upon the diaphragm. The photograph shows H. E. Hiller operating a new audio-frequency vacuum-tube amplifier microphone on a land-live circuit to the transmitting station WJZ, Newark, where the concert is broadcast.

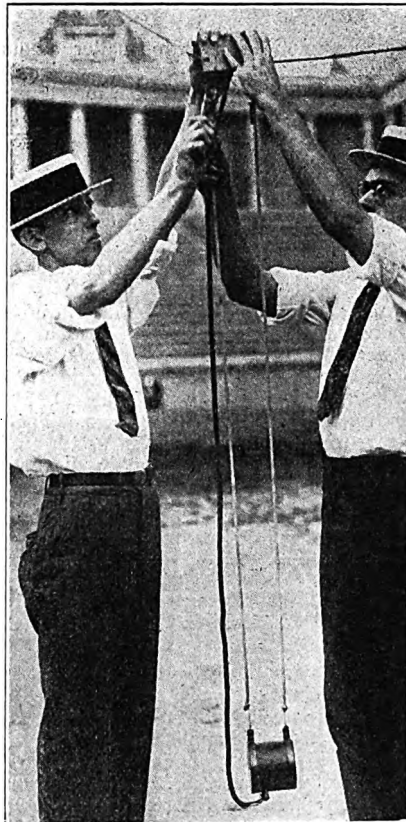
A VALUABLE radio experiment was conducted, at the stadium of the College of the City of New York the other day. A symphony concert was played by the New York Philharmonic Orchestra in the open air. By means of the telephone the music was heard in the Westinghouse broadcasting station at Newark. From there it was sent out by radio 2,000 miles.

The possibilities from combining the telephone and the radio are vast, says "The Mail," New York. The restriction on radio broadcasting has been the mechanical need for having the original sounds made in the broadcasting station. The music, speech, play, or whatever was to be sent out had to be given at the station within the scope of the apparatus.

By combining the telephone with the station any music, speech, or play can be sent to all the receiving sets within the territory covered by the station.

When President Harding spoke at the memorial exercises over the Unknown Soldier, the address was heard distinctly in Madison Square Garden, where amplifiers had been connected with a direct telephone wire from the Arlington Cemetery. The speech was also heard in other cities, but only where similar arrangements were made and amplifiers had been provided. If the same means had been used and connections made as with the symphony concert at the stadium, the ceremonies at Arlington could have been heard by every radio receiver.

This latest development will enable people who so desire to hear the proceedings at a national convention or the speeches in Congress. Perhaps that will not prove a blessing; it may only increase the proverbial long windedness of the political orator.



(C. Kadel & Herbert News Photo)
Putting the microphone transmitter, the black object near the ground, in place.

King Radio Takes Soundings

THE gentlemanly navigator of tomorrow, says "The Outlook," is a radio engineer. He sits at a mahogany table in a comfortable office on his modern ship, smoking fat cigars, pressing neat pearl-

topped buttons and letting King Radio do the rest. One button tells the depth of water under the keel, another the distance and direction to the nearest ship, and of all ships within a radius of twenty-five miles.



Now wireless
receiving set
is complete
without

MAGNAVOX
Radio

WHEN the club House Committee meets again, be sure to propose the installation of a wireless receiving set.

If equipped with Magnavox Radio (the reproducer supreme) the club, lodge, hotel or home wireless station will furnish everybody the best of dance music, concerts, market reports, world news events and entertainment—something or other going on almost every hour!

Any radio dealer will demonstrate, or write us for illustrated folder and name of nearest dealer.

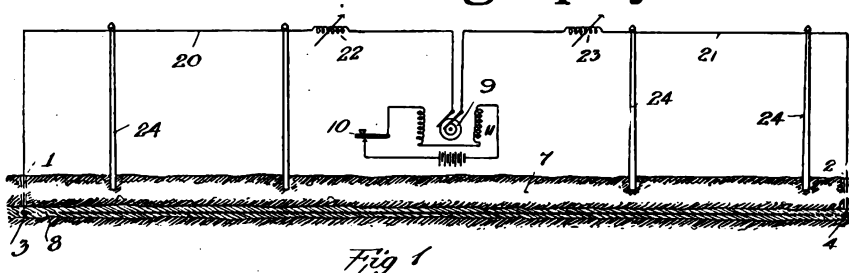
The Magnavox Co.
Oakland, California
N.Y. Office: 370 Seventh Ave.

MAGNAVOX
Radio

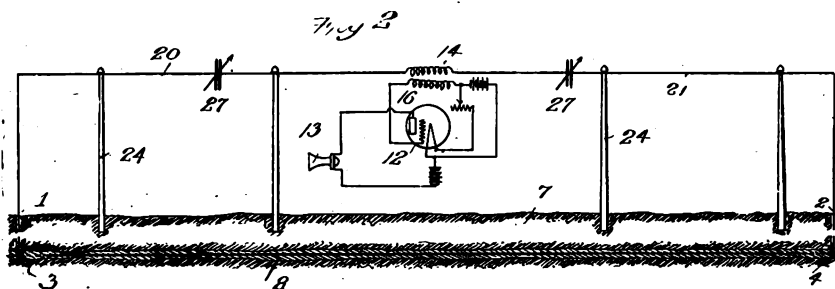
The Reproducer
Supreme

Radio Patents

Lee de Forest's Subterranean Signaling System Based on Radiotelegraphy



Schematic diagrams of Dr. de Forest's new signaling system. Figure 1 (above) describes the transmitting station. Figure 2 (below) describes the receiving station.



No. 1,424,805. Patented August 8, 1922.
Patentee: Lee de Forest, New York City, N. Y.

LEE de FOREST, eminent radiotrician and inventor of the phonofilm by which the actors appearing in moving pictures may speak to their audiences, announces what appears to be a practical invention to produce subterranean signaling—more particularly in electrical systems. One will secure a clear idea of Mr. de Forest's device by studying the accompanying diagrammatic views.

Figure 1 represents the transmitting station, as above outlined and, in the form shown, is a telegraph transmitting station wherein any suitable source of current may be employed, such for example, as the alternating current preferably of sustained waves and of frequency low as compared with those now used in radiotelegraphy, that is, from 500 to 25,000 per second. The current thus generated may be controlled in any desired manner, for example, by the Morse key 10, located in the field circuit 11, of the dynamo.

"While I have shown the system as a telegraph system," says Mr. de Forest, "it is obvious that with but slight modification the system may be employed for telephone signals, and many of the improved apparatus, well known in the art for use in connection with either of the telegraph or telephone systems, might be readily employed without departing from the scope of my invention. The earthed circuit is preferably attuned to the generator frequency by suitable means. I have discovered that for the frequencies above described the earth offers comparatively little impedance so that relatively large amounts of energy are radiated or sent out in the form of conduction currents so that great distances can be covered by this means of signaling, comparable even with those attained in

radio communication with smaller amounts of energy at the transmitter. By this system I am enabled to avoid the interferences caused by atmospheric disturbances which so frequently interrupt aerial radial communication."

The problems of interferences between several stations are similar to those in the present radio art and are overcome in the same manner as in the present art for example, by tuning to resonance between stations.

At the receiving station shown in Figure 2, the source of alternating current 9 is replaced by a detector and telephone receiver for example, by the audion detector 12 associated with the overhead line 20, 21 by the transformer 14, 16 as shown. The receiver 13 is included in the usual audion receiving system well known in the art.

* * *

Hydrometer to Measure Density of Liquids

No. 1,424,730. Patented August 1, 1922.
Patentee: Charles E. Linebarger, Chicago.

THAT class of hydrometers which have both constant weight and volume and are not provided with a linear scale, will be improved by the application of Mr. Linebarger's invention, which consists of a transparent container in which are confined solid bodies having different specific gravities so arranged as to float or sink when liquids of different specific gravities are introduced into the container.

It further consists of solid bodies within a containing vessel, each of which has a homogeneous composition, so that if one be broken, its fragments, all having the same specific gravity, will function as well as the integral solid body.

Homogeneous solid bodies are, also, confined in a vessel, these bodies being com-

posed of materials that have practically the same coefficients of expansion to the end that changes of temperature may affect the specific gravities in practically the same way. "As there are comparatively few chemically pure substances having properties that render them suitable for use as such solids," says Mr. Linebarger, "I combine certain substances in order to produce solids that may have a desired specific gravity and may not be affected physically or chemically by the liquids in which they may be immersed. For use in liquids, the main ingredient of which is water. I melt together Trinidad Lake asphalt with other substances of similar nature, or origin, such as gilsonite,

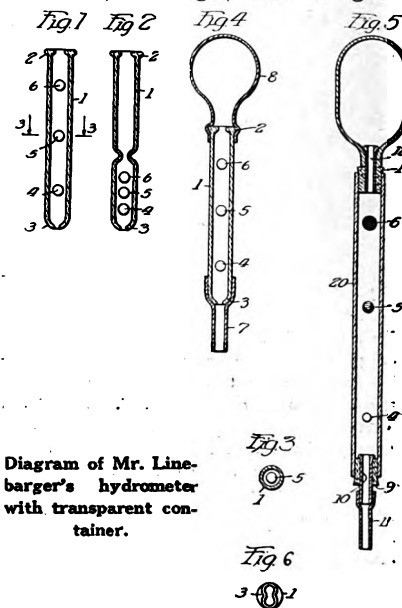


Diagram of Mr. Linebarger's hydrometer with transparent container.

ozoocerite and elaterite; or with such substances as tar, rosin, or paraffin. I also fuse together various varnish gums, such as kauri pontinak, shellac and damar gums, with different waxes or other organic substances of different specific gravities. With such fused mixtures I incorporate, in case the mixtures themselves are not heavy enough, finely powdered solid substances such as soapstone, mica, graphite, or silica. The proportions of such ingredients vary according to their own specific gravities as well as the desired specific gravity of the blended product. In order to distinguish the solid bodies from one another, I make them, as the case may demand, of different sizes, shapes and colors."

* * *

Commandments for the Owner of a Loud-Speaker

1. Don't use more amplification than is necessary.
2. Don't force the loud-speaker to the limit.
3. Don't forget that careful control or the regeneration will permit the use of less tube amplification.
4. Don't overload the plates of your amplifier tubes.
5. Don't let the tube and socket contacts become dirty.
6. Don't expect the loud speaker to do the work of a one-step amplifier.
7. Don't allow sloppy soldering of amplifier connections.
8. Don't attempt to use run-down B batteries.
9. Don't try to use an amplifier tube as a power amplifier.
10. Don't forget that clearness is as important as volume.—"The Mail," New York.

Subscribe direct or through your news dealer. \$6.00 a year, \$3.00 six months, \$1.50 three months. Radio World, 1493 Broadway, N. Y. C.

Radio Manufacturers Form New Sales Combine

MANUFACTURERS of radio equipment in the United States have formed a sales combine. The new organization will act as a distributor for the firms comprising its membership.

The name of the new organization will be Fourar Radio, Inc. Its officers and directors comprise the chief executives of concerns engaged either in production or in merchandising on an extensive scale.

Fourar Radio, Inc. will act solely in a distributive capacity. It will draw for its supplies on manufacturers who rank as the oldest and most dependable. It will supply the public through department stores. Its claim is that it will meet the demand for standard radio equipment by dealing with firms defined by such representative bodies as the National Retail Dry Goods Association.

The first vice-president is William Dubilier, president of the Dubilier Condenser & Radio Corporation. The second vice-president is Frederick Dietrich, president of C. Brandes, Inc.

The third vice-president is Maurice C. Rypinski.

The secretary and treasurer is Arthur Wiesenberger, general manager of the Alfred Fanti Buying Organization, and formerly Director of Research of the National Dry Goods Association. It was Mr. Wiesenberger who represented the National Retail Dry Goods Association at the conference in Washington with the Bureau of Standards which resulted in the adoption of the first official method for determining the practical service values of all radio appliances to be put on the market. Mr. Wiesenberger is also author of the first book on radio merchandising, published several months ago by the association.

The lines handled are the products of the Radio Corporation of America, the standard of this country, embracing complete receiving sets, tubes and all equipment; the Dubilier Condenser & Radio Corporation, manufacturers of Dubilier condensers; C. Brandes, Inc., manufacturers of Brandes Matched-Tone head sets, and the National Carbon Company, manufacturers of American Ever-Ready Batteries.

The National Retail Dry Goods Association, composed of some 2,000 leading department stores, and specialty shops in the country handling close to 50 per cent. of the \$7,000,000,000 annually of department store sales, realized months ago that radio, if it is to be commercially on a plane with the phonograph, must be standardized and must be sold by retailers of resources which qualify them to guarantee to the public radio sets and equipment of merit and service comparable with the phonograph, the piano, and with every other article that enters into general consumption.

They will endeavor to maintain a standard which will render service completely satisfactory to the public, to sell at prices which will enable manufacturers to guarantee deliveries; to provide a discount for the retailer that will permit of profitable merchandising, and to remove the complications now besetting the sale of radio so effectively that its sale to the public shall be established on a sound, profitable basis.

A Radio Necessity!

Latest broadcasting map 15c. That is, a complete broadcasting map appeared in Radio World, No. 8, dated May 20. Mailed on receipt of 15c. Radio World Company, 1493 Broadway, N. Y. C.

Subscribe for Radio World, \$6.00 a year, \$3.00 six months, \$1.50 three months.

Remington Terminal Indicators

5 CENTS EACH



Type A

REMINGTON RADIO CORP., FRANKLIN, MASS.

A perfect panel engraving imitation. Fits any binding post. Black japanned, white enameled letters. Supplied in the following: Antenna, Ground, Phones, Grid, Input, Output, A Bat +, A Bat -, B Bat +, B Bat -. Lettering in two positions. Order direct from ad.

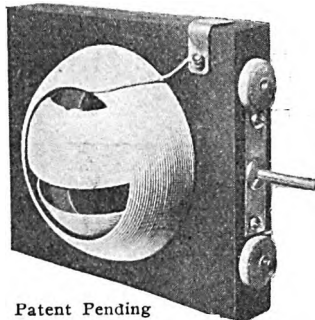
Dealers! Write for Discounts!



Type B

RADIOMART VARIOMETERS ARE SELLING FAST!

The Design Is As Efficient As It Is Exclusive



Patent Pending

Such is the VERDICT of all radio men. There is a minimum clearance between stator and rotor; our process makes the coils as strong as metal; with no dielectric losses; nickel plated brass bearings. A three-inch dial will cover the two mounting screws.

RADIOMART variometers are best for 3 circuit and single circuit receivers. Wave length, 150-600 meters. They are the neatest and best shaped variometers made anywhere. Satisfaction guaranteed.

Price, \$5.00 prepaid. Cash or C. O. D.

Our Literature Is Free!

More Dealers Wanted!

RADIOMART CO.

1230 American Ave.
Long Beach, Calif.



Hard Rubber Composition PANELS

Conform to Navy Specifications

A High Resistance Panel, Guaranteed Not to Warp, and Drilled Cleanly Without a Burr. Highly Polished—Edges Ground to Size.

Standard sizes, 7x10x3/16, 7x15x3/16, 7x24x3/16, 10x12x3/16, and 12x14x3/16, in stock for immediate delivery. Orders for special sizes received in the morning, shipped the afternoon of the same day. Binding posts, dials, and knobs to match. We have a complete line of Coils, Variometers, Variocouplers, Sockets and Rheostats.

Largest Discounts.

Jobbers and Dealers! Write for proposition and Free Sample!

CAREFUL ATTENTION GIVEN
TO ALL RADIO ENTHUSIASTS

ALLIED RADIO COMPANY, INC.

Dept. D, 449 SEVENTH AVENUE, NEW YORK CITY, Fitzroy 3731

WANTED—A Reliable New England Representative.

SPECIAL INTRODUCTORY BARGAIN

DICTOGRAPH HEADSET \$9.00

3000 ohms \$12 value

DEALERS WRITE

**CENTRAL-KANSAS
RADIO WHOLESALE CO.
LYONS, KANSAS**

Advertising Rates, Display, \$5.00 per inch, \$150.00 per page

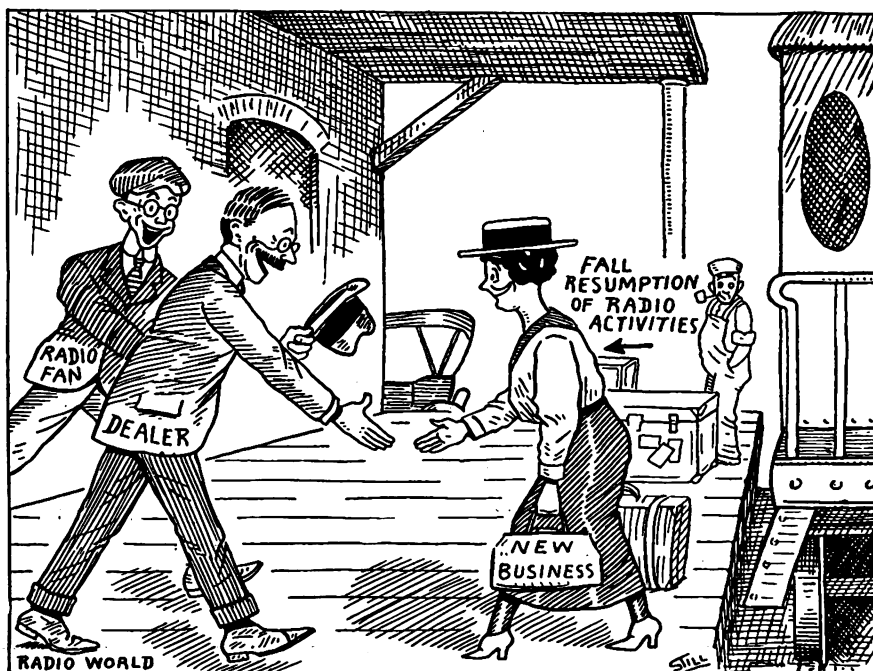
Radio Merchandising

Classified Quick-Action Advertising, 5 cents per word

Telephone Bryant 4796

"Welcome Home from Your Vacation!"

Cartoon by Harry B. Stillman



Let Radio World Test Your Goods Free of Cost

Manufacturers, send a sample of your goods to our Technical Editor, Fred. Charles Ehlert, 9006 Pleasant Street, Queens, Long Island, N. Y. It will be carefully tested and returned. If your goods satisfy our experts, RADIO WORLD'S endorsement will be published in our merchandise department without charge or obligation of any kind on your part. This is a free service on the part of RADIO WORLD, calling for no expense whatsoever on the part of the manufacturer, except the sending of a sample of his goods.

Variable Condenser of 21 Plates (Radio Stores Corporation, 218 West 34th Street, New York City)

A 21-PLATE variable condenser of neat construction with a capacity of .00052 microfarads. The plates, which are of aluminum, are secured and held firmly in their proper position by lead pillars. The dial, which is furnished with the condenser, is of pressed metal, provided with a lead counterweight which counterbalances the movable plates. The knob is held to the shaft of the condenser by a set screw and made adjustable so it can fit any size panel. Molded insulation is used. All burrs have been carefully removed from the plates so as to keep the leakage problem down to a minimum. Good contacts are provided for.

Variometer in Two Circuits (Star Radio Manufacturing Co., 122 Fifth Ave., New York City, N. Y.)

STAR variometer has been tested out in two circuits. On one circuit it was placed in the aerial circuit of an oscillating receiver. In this circuit, it was found to have a wavelength range of 500 meters. When placed in a regenerative circuit, it was found to respond to a wave-length range of 400 meters.

The rotor and stator are turned mahogany.

Rotor is wound with cotton-covered magnet wire, also the stator. The rotor is supported on a quarter-inch brass shaft mounted on brass bearings between springs, which tend to keep it in proper position. Fahnestock clips are used for the connections. Construction and appearance very good. Nicely finished for panel mounting.

43-Plate Variable Condenser (Fett & Kimmel, Radio Instruments, Bluffton, Ohio)

A WELL-DESIGNED and constructed 43-plate variable condenser, the capacity of which was found to be .001 microfarads. The construction of this condenser is as follows: End plates are of pure bakelite, with edges and faces highly polished. All plates are of the best grade, even-gauge hard aluminum with edges so cut as to allow no burrs. The stationary plates are mounted, on three brass posts and equally spaced with micrometer separators. The movable plates are mounted on a solid brass shaft, accurately spaced and locked to correct position. No counterbalance is used as the rear end of the movable plate-shaft projects beyond the frame and makes contact with an adjustable tension-plate that may be tightened with a screw to prevent the plates from turning after the desired wave length has been obtained. The condenser is nicely finished and when used in a set comprises a satisfactory receiver ready for panel mounting.

New Firms and Corporations

Notices in this department are considered as purely interesting trade news and published without compensation to us. We welcome trade news of this nature. All notices having an advertising angle are referred to our Advertising Department, and are placed under Classified Advertising at 5 cents a word, or as Display Advertising at \$5 an inch.

(The firms and corporations mentioned in these columns can be reached by communicating with the attorneys, whose addresses are given whenever possible.)

North American Radio & Supply Corp., Delaware. Representative: H. Goldman, 5 Columbus Circle, New York, N. Y.

The Electrical Societies and Construction Company of New York has increased its capital from \$1,000,000 to \$2,000,000.

Nicholson & Loertz, radio, Vincennes, Ind. The Electric Specialty Co., 83 East Long St., Columbus, O., has added a radio department.

Original Marconi Apparatus to Be Seen

THE American Radio Exposition will be held in Grand Central Palace, New York City, from December 21 to 31, under the direction of the American Radio Exposition Company, 120 Broadway. Radio apparatus, accessories and materials will be exhibited by manufacturers and dealers and there will be daily orchestral concerts, numbers by grand-opera artists, broadcasting, illustrated lectures and other entertainment and educational features.

The practical uses of radio and the principles on which it operates will be explained through the medium of motion pictures and by actual demonstration of apparatus. There will be a lecture by a prominent engineer on Senator Marconi's latest development in directional wireless. Senator Marconi has loaned his original equipment, and a duplicate of it will be exhibited and demonstrated in conjunction with the lecture.

Sound-proof rooms for the demonstration of loud-speaking devices will be constructed by exhibitors, each room to have a window opening on the street or areaway so that it may be ventilated without interfering with the demonstration of other apparatus.

Various other activities are being planned by the officers and directors: Frank Hitchcock, president; Walter Gordon Clark, consulting engineer of New York, vice-president; Harold Bolster, Bolster & Co., New York, secretary and treasurer; George Brokaw Compton, of Peaslee & Compton, lawyers, New York, and Chester Humphrey, vice-president of the Old Colony Trust Company of Boston, directors.

Permanent Radio Fair for Buyers

SINCE New York City is the largest buying center in the United States, there has been a growing need for a centralized exhibition of radio apparatus where merchants and purchasers could go to view representative apparatus. Such an exhibition to be known as the Radio Fair has opened in the Red Room, Hotel Imperial, 31st and 32nd Streets and Broadway, New York, under the direction of Raymond F. Yates.

The radio fair will be open to buyers only during the morning and business cards only be accepted for admission. An expert radio engineer will be in attendance to explain and demonstrate apparatus to buyers. In the afternoon and evening the room will be open to the general public. The fair will close in May, 1923.

Clark Says—

TO merchandise radio goods successfully and in a big way, three classes of people must be not only reached but sold; i. e.: Radio Dealers, Electrical Dealers, and—most important of all—the ultimate consumer.

If my advertising appropriation were limited, I would select only one—the one I considered best in each of the three fields, Electrical, Dealer, and Consumer. As to space, I would use not less than four-inch double column, for four consecutive issues, and increase the space as business would warrant in these three publications until I became a page advertiser before adding other publications.

It is not hard to select the two best dealer-publications. Their rates are low on account of their necessarily limited circulation, as there are less than 5,000 legitimate radio-dealers in the United States. With the fan or consumer publications the choice is more important, as there are several excellent radio monthlies but only one national radio weekly.

RADIO WORLD is the one and only national illustrated weekly with a distribution from Coast to Coast. It offers advertisers these advantages:

First, quick results; advertising copy received on Wednesday is on newsstands the following Wednesday.

Second, **RADIO WORLD**, as a weekly, is truly a Radio NEWS paper. For instance: When the Armstrong superregenerator first came out, it was fully illustrated and described in four successive issues of **RADIO WORLD** before the monthlies had it.

In fact, the marvelous new things in radio coming out each week is "old stuff" before the monthlies can publish it, as **RADIO WORLD** has it four to six weeks in advance.

Third, and most important of all, is size. A weekly is less bulky than a monthly, so even a small advertisement is next to reading matter and is seen and read in our weekly. What chance has a small advertiser sandwiched in between a hundred pages of solid advertising that some of the radio monthlies carry?

Thousands of dealers, too, buy **RADIO WORLD** each week, as they realize the necessity of keeping up to date and knowing "what's new" quick.

RADIO WORLD has been tested with keyed advertisements time and time again in competition with the best and most expensive radio monthlies, and each time has brought more actual results—orders. These result tests are available for the asking. Seventy thousand radio fan readers, the buyers, the ultimate consumers of radio goods, can be reached each week by **RADIO WORLD** at a cost of \$4.25 per inch on a yearly advertising contract. Our advertising rate in 60 days will probably be \$10.00 an inch; and, by spring, if increase in circulation maintains, will be \$15.00 an inch.

Write Fred S. Clark, Manager,
RADIO WORLD, 1493 Broadway, New York City, N. Y.,
for "Brass Tack" Facts on Radio Merchandising.

Quick Radio Service Helps Farmers Sell Crops

THE New Jersey State Bureau of Markets, at Trenton, has announced that the perfection of the radio service of the bureau now enables a New Jersey farmer whose home, farm, club, or bank is equipped with a radio-receiving outfit to have actual up-to-the-minute information on prices at which his crops, shipped into New York, Newark or Philadelphia that day, are bringing in the city markets.

The advice flashed to him each morning, with an afternoon and evening supplemental service, will permit him to make a wiser choice of shipments and in the event of sudden gluts in certain markets, will enable him to select more satisfactory destinations for his quickly perishable products.

In collecting the information, which necessarily must be accurate. Burton W. Sherburne, market crop reporter of the State Bureau of Markets, who is directing the radio service, will have the cooperation of the Federal Bureau of Agricultural Econom-

ics and the Pennsylvania Bureau of Markets. Many farmers are said to be installing receiving apparatus in order to get the reports in their own homes. Banks, newspapers and boards of trade are also taking the reports and posting the information in bulletins or relaying it to distant farms by telephone.

New Broadcasting Wave Planned

WASHINGTON, D. C.—The Department of Commerce contemplates inaugurating a new class of license for broadcasting stations which can meet certain requirements. These stations will be known as Class B stations and will be authorized to use a wave length of 400 meters. The qualifications necessary for obtaining this class of license will be ready for distribution within a few days, and will also be published in the September issue of the Radio Service Bulletin. The new wave length may be used only with specific authority of the department in special cases.

British Engineer Studies American Radio Progress

GREAT BRITAIN will solve the interference problem in radiophone broadcasting by government control and regulation," according to A. P. M. Fleming, C. B. E., manager of the research and educational department of the Metropolitan-Vickers Electrical Company, Manchester, England. Mr. Fleming represented England at the international convention of the Institute of Electrical Engineers and the International Electro-Technical commission at Niagara Falls.

"We have learned many valuable lessons from the broadcasting experience of the United States," said Mr. Fleming to a reporter for "The World," New York, after his visit to KDKA, pioneer broadcasting station of America, located in the East Pittsburgh Works of the Westinghouse Electric and Manufacturing Company. "One of the things we have learned is to avoid the establishment of innumerable radio-stations, with no plan of cooperation between them. Eight one-and-a-half kilowatt stations are contemplated and some of these will probably be built this year. These stations will be located in the principal cities throughout the British Isles and will be operated so as to eliminate the chaos usually found where no rules are in force.

"We have no such things as broadcasting in Britain at present in the same sense as the term is used in America," he said. "Government restrictions have prevented it, on account of the possible interference with the requirements of the navy, mercantile, marine, war services and aeroplane traffic. But the largest manufacturers of radio apparatus have cooperated with the British Government officials in working out plans for the proper control of broadcasting."

Coming Events

The editors of RADIO WORLD will gladly publish news items of all contemplated radio shows and expositions. Keep us posted by mailing full information.

ANNUAL SHOW OF THE ST. LOUIS RADIO ASSOCIATION, St. Louis, Mo., October 4 to 7, inclusive.

CHICAGO RADIO SHOW, Coliseum, Chicago, Ill., October 4 to 22. U. J. Hermann, managing director, 549 McCormick Building.

INTERNATIONAL RADIO EXPOSITION, Grand Central Palace, New York, December 21 to 30.

KANSAS RADIO EXPOSITION will be held at the Kansas State Fair, Hutchinson, Kansas, September 16 to 22, inclusive. A. L. Sponster, secretary.

RADIO CLUB OF AMERICA. First autumn meeting will be held the last Friday in September. Renville H. McCann, secretary, Columbia University, New York.

CLEVELAND RADIO AND ELECTRICAL EXPOSITION, Cleveland Public Auditorium, Cleveland, O., August 26 to September 4, inclusive.

CINCINNATI RADIO-AND-ELECTRICAL EXPOSITION, Music Hall, Cincinnati, O., October 7 to 14, inclusive.

NEW YORK ELECTRICAL AND INDUSTRIAL EXPOSITION, Grand Central Palace, New York City, October 7 to 14, inclusive.

NEWARK'S SECOND ANNUAL RADIO SHOW, Robert Treat Hotel, Newark, N. J., October 4, 5, 6 and 7.

SECOND NATIONAL RADIO EXPOSITION, direction International Trade Exposition Co., Chicago, January 13 to 20, inc., 1923, George A. King, director of publicity, 417 South Dearborn Street, Chicago, Ill.

PERMANENT RADIO FAIR FOR BUYERS, Hotel Imperial, New York City. Open from September, 1922, to May, 1923.

AMERICAN RADIO EXPOSITION, Grand Central Palace, New York City, December 21 to 31, inclusive. Direction American Radio Exposition Company, 120 Broadway.

BOSTON RADIO EXPOSITION, AND NEW ENGLAND AMATEUR CONVENTION, Mechanics Building, Boston, October 30 to November 4, inclusive.

**"With Sales Slips Totaling
\$50.00 We Give \$5.00
Merchandise Free"**

We handle all standard makes of sets and parts. Order from any catalogue.

"WE PAY EXPRESSAGE"

SPECIALS

S. E. Radio Frequency Trans..\$6.50
Murdock Phones, 3000 ohm... 6.00
Genuine Audiotrons..... 6.00
Adapters 1.50
Asteroid Triple Coil Mounts.. 5.00
Framingham Rheostats..... 1.00
Duo-Lateral and Remler Honey-
Comb Coils all sizes

Butters-Horlick Radio Co.
258 Wash. St. Boston, Mass.

**The Mark of
the Quality
Radio Store—**



WHEN you see this sign on the clean plate-glass window of a radio shop *you may enter*—assured that the apparatus and prices are right; the stock complete; a competent radio expert in charge;—and the Golden Rule in force.

"It Pays to Buy at the Sorsinc Store"

Mr. Dealer:—If you are a progressive merchant, you may display the Sorsinc sign. Let us tell you how. Ship Owners Radio Service, Inc., 80 Washington St., N. Y. **WHOLESALE DISTRIBUTORS**

Latest broadcasting map 15c. That is, a complete broadcasting map appeared in Radio World, No. 8, dated May 20. Mailed on receipt of 15c. Radio World Company, 1493 Broadway, N. Y. C.

Radio News, Not Criticism

EDITOR RADIO WORLD: As a subscriber to your magazine since its conception, I have been an interested reader and look forward each Wednesday to its coming. I cannot, however, say that I admire the stand you have taken in regard to the new broadcasting schedule in the Metropolitan district, nor do you gain any new admirers by the publication of such an article as appeared in your August 5 issue under "Radiograms."

The article I refer to is that having to do with one "recalcitrant" member who was finally persuaded to agree to the new schedule and your hope that it would not be necessary for the Radio Broadcasting Society of America to publish the name of the concern. This article without any doubt, whatsoever, must have been penned by someone who has a grudge against the Westinghouse organization, or does not possess a receiving set.

Some time has now passed with the new schedule in operation and the radio fan has a pretty fair line on the new layout; he has seen whole evenings, not to mention many, many hours of the day, wasted by stations which, while demanding a place in the schedule, cannot get programs beyond their lot line; if it is the society's idea to permit the so-called broadcasting stations to experiment on the public, the new schedule is an immense success; if, on the other hand, it is their desire to improve broadcasting, it would be much more to the point to reduce the list of stations engaged in this work to a matter of three or four and make the newcomers prove that they can deliver the goods before assigning them several hours out of the day and evening. The Westinghouse concern has done more for the wireless enthusiast than all the rest of them put together. Little wonder that the rest of them are so dissatisfied, but their dissatisfaction savors very strongly of the "dog in the manger" idea. If their equipment is not such as can render a real broadcasting service, they do not want those who are in position to do it.

Why hold back the name of the concern? Why not publish it and make known to your readers that there is at least one *real* station which stands for *real* broadcasting? Why not come out into the open and give your readers the facts?

In prohibition, and other so-called reform movements, we have the blue-nosed Johnnies and the long-faced Annies; it is only a matter of time before they will enter the radio field. Pussyfoot Johnson admits he likes a drink now and then, yet he goes out in the land and, for personal gain, does everything he can to take a drink away from the other fellow. Real Americans do not like hypoc-

ris, and no one ever got anywhere in this country practicing it. Webster defines hypocrisy as "pretence." The concern which pretends to give a broadcasting service and asks for a place in the so-called new schedule and, because of inadequate facilities, cannot render such service, when others can, is scarcely the concern which should be lauded in your magazine, and most especially not at the expense of an organization which has been, and is now, giving the listening-in-public a *real* service.

In conclusion, let me say that I have only a small, inexpensive set—the same as possessed by thousands of other radio fans in New York City. Although small and inexpensive, I have had over fifty stations on it since its installation May 1, among these being Schenectady and other stations at some considerable distance.

Instead of wasting good space in your interesting magazine by publishing such an article referred to, why not devote your energy and influence along lines which will result in the right kind of support for those few stations whose equipment means better broadcasting; devote the same amount of space to a sharp criticism of the bird who persists in sending code during the broadcasting of an opera and other programs, and particularly land on the rank brass-pounder who keeps his key wide open for two and three-minute intervals? You would then be doing something really constructive and of real benefit to the listening public.—**FRED E. REM**, 138 Haven Avenue, New York City.

(RADIO WORLD has never had the slightest intention of publishing anything adverse regarding the broadcasting efforts of the Westinghouse Company; or any other concern, for that matter. In fact, we have published several very complimentary special articles explaining the work of the Westinghouse Company in its efforts to promote radio. "Radiograms" is a weekly record of radio news, and when the item Mr. Reid criticizes us for publishing came to the office the name had not been made public. It was printed merely as news matter and not as editorial criticism.—THE EDITORS).

Crystal Detector Coming Back Into Favor

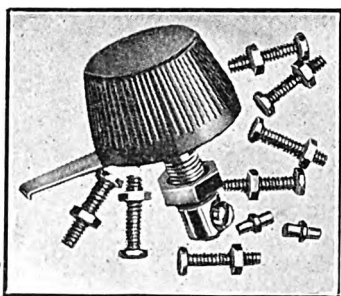
THE much maligned crystal detector seems to be coming more and more into popular favor, says William F. Crosby in "The Globe," New York. From actual observation in the radio stores, it has been found that these little instruments are gaining steadily in popular favor not only with the novice but with some of the old-time amateurs themselves. For broadcast reception the crystal detector is pretty hard to beat when it comes right down to clear and undistorted speech or music. A great many owners of radio sets seem to be going in for a detector of this type, sometimes connecting it to a two- or three-stage amplifier. If a good piece of mineral can be secured, and this detector connected up to the proper amplifier, it has been found that the music, while not as loud as with the vacuum tube detector, is very much better in other ways.

No Free List

RADIO WORLD has no free list. The only copies sent out by the publishers are to fill the ever-increasing orders of the American News Company, the large numbers of subscription orders received at the office of publication, and one voucher copy to each advertiser and advertising agent represented in current issues.

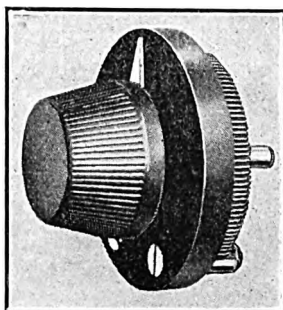
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Amateur Radio Work Restricted in Germany

GERMAN manufacturers of radio apparatus are not in a position to make extensive deliveries of their product, according to Vice-consul Nathaniel B. Davis, Berlin, in a report to the Department of Commerce. This is due to the fact that the demand has not been sufficiently great to warrant the manufacture of radio instruments in large quantities.

Amateur radio work is not popular in Germany and stations are not numerous. Radiotelephony in particular is almost an unknown science except to engineers, professional operators, and experimenters. The principal reasons given for the lack of interest in radio on the part of the general public are that amateur stations are a luxury beyond the means of the average German, under present economic conditions, and official restrictions on their use.

All radio communication in Germany is under the control of the Federal Post Office Department, which operates the commercial stations. Private installations must ordinarily be made by the department. In exceptional cases private companies or individuals may be authorized to erect their own plants, but they must first obtain a license from the Post-Office Department. The fee for such a license varies according to the size of the plant, with a maximum of 2,000 marks a year.

At present, only one station in Berlin is licensed to broadcast. This station broadcasts market and exchange quotations. Subscribers to their service are permitted to install receiving stations upon payment of the license fee and the monthly subscription rates which vary at present from 1,000 marks to 7,500 marks according to the class of subscription. Subscribers may rent receiving sets from the Post Office Department for 2,500 marks a month if they do not desire to build their own.

Notwithstanding the lack of demand for short-wave amateur apparatus there are a number of firms in and about Berlin which manufacture receiving sets.

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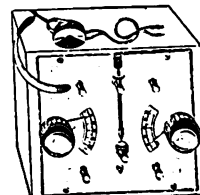
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Pictures and Facts

About

Armstrong Amplifier

Radio World has published a number of pictures, diagrams and descriptive articles regarding the New Armstrong Super-Regenerative Amplifier. The numbers containing this material are dated June 24, July 8, July 15, and August 5. They will be sent postpaid on receipt of 15 cents each, the four copies complete for 60 cents. Or you can subscribe, \$6.00 year; \$3.00, six months; and have your subscription start with the number dated June 24. RADIO WORLD CO., 1493 Broadway, New York.

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The Radio "Colyum"

LEADING newspaper in New Jersey town recently announced it would receive a running account of an important prize fight on radio apparatus installed for the use of its readers. Not long before event took place, local authorities interposed. Announcement of event then ran something as follows: "The prize fight program this evening has been changed to a sermon."

Roy K. Moulton informs that the only lightning to fear these summer days is the brand that comes in quart bottles.

"Surprised at the careworn expression on the usually gleeful radio operator's face, his friend asked, 'Why so glum?'"

"I m-m-mixed the A and B leads to my power tube," was the reply.

Lady walking along Fifth Avenue turned to her pet poodle and called, "Hear, Radio! Hear, Radio!" Dog responded with alacrity.

"Ancient Order of Night Owls" is name of Western radio club. Can't join unless you're able to prove you've actually sat up till breakfast with the old head clamps on.

Again, Rollo, we must set you right: A radio "ham" is not a porcine edible, but a human being. And you will not find in any ornithological tome that "hoot owl" and "night owl" belong to the same family. You're dumb when it comes to beasts and birds, Rollo!"

Colonel Edward H. R. Green, son of the late Hetty Green, multi-millionaire, has turned his beautiful country home, Round Hills, Mass., into a veritable radio palace.—*Newspaper report.*

(With radiopologia to the late Mr. A. C. Swinburne, we tune in thusly:)

If you were some fair goddess and I were Colonel Green,
We'd have a radio outfit if it cost me every bean;
We'd sit all day and broadcast—from dewy morn till e'en—
If you were some fair goddess and I were Colonel Green.

If I were Colonel Green, dear, and you some goddess fair,
We'd have ten Armstrong circuits and corner all the air;
I'd call my dog, "Galena"; put permanent wave-lengths in your hair—
If I were Colonel Green, love, and you some goddess fair.

Our Own Broadcasting Station

OUCH for Week Beginning September 4, 1922

- 7:00—Stories heard at the weekly meeting of the Women's Bridge Club. (Limited to one hour.)
- 8:00—Why We Protest Revolving Barber Poles, by the Home Brewers' League.
- 8:31—That Lullaby of Uselessness: "When Father Shampoos His Toupee."
- 8:47—Will Hays, Judge Landis and Augustus Thomas reciting, "Three Wise Men Who Went to Sea in a Boat."
- 9:02—Reading: "Thank Heaven, We Have Prohibition." From a bootlegger's library, and not censored by Mr. Sumner.
- 9:30—How to cook storage eggs that have not been vaccinated.
- 9:47—Pullman's upper-berth stories. (Rigidly censored by Mr. Sumner.)
- 10:01—Why I Am Greater than Houdini. By a man who has dodged motorcars in New York City for ten years.
- 10:22—Correct time from some one who loaned you a ten-spot.

ROBERT MACKAY.

Has Your Set Been Idle All Summer?

Here Is a Bit of Advice

NO doubt many radio sets have laid idle all summer, owing to the absence of their owners, or the lack of enthusiasm of the owner for sitting indoors listening to the program when he might have been off in some park listening to a real band.

It is going to be quite a job getting these sets back into condition again this fall, says "The Globe," New York, and a few hints relative to the several small points will not be out of place at this time. Already the cooler nights are with us, and listening to radio is not half as hard as it was a month ago.

One of the most serious troubles that may have developed during the summer is in the storage battery. If this has been left in a discharged condition, or if the electrolyte or liquid has become low, the battery may have sulphated to a certain extent, and consequently will not hold its charge when the time comes for recharging. The beginner may learn a lesson in this way, and it may be possible that a new battery may have to be purchased. A storage battery is a delicate piece of apparatus despite the fact that they seem to weigh a lot, and it does not take very much to make them useless. Sulphating of the plates is caused very easily by improper care and cannot be very well overcome. Another bad thing that may happen to a battery that has been standing all summer is the short-circuiting of the plates. It seems that there is a tendency for part of the element to fall down to the

bottom of the battery and this element being metallic, it will surely form a circuit between the plates and kill the battery as dead as it is possible for one to become. It will also prevent the recharge of the battery owing to the fact that the current will simply take this shortest route and not charge up the plates at all.

Joys of a Radio Editor

WE have been very busy in the office, these days, sorting out and classifying the questions, and preparing the answers therefor as they arrive, writes Harry La Mertha, in the "Globe-Democrat," St. Louis. Some of the diagrams that come in are beyond all hope. They look like the mad ravings of a deep-sea diver who is trying to chart the possible location of Captain Kidd's gold, after a tip given by a Wellston trance juggler. Hetty Rodyne opened the mail this morning and after working four hours and eleven minutes said she would rather work in a field than help any over-worked radio editor.

Accordingly we assigned her to Charlie Morton's carrier wave and told her to get out and look over some of the country it covered. She set her course southeast, a half south, and in due time, possibly two seconds, having been delayed by heavy cross seas from the Granite City gang who were stirring it up in great shape with spark and (CW) Hetty was in the area bounded by the four lines of Williamson County, Illinois.

Things were a little wobbly in the ether here (due no doubt to unsettled conditions below) and she paused to take hearings.

"I noticed lots of commotion off to the westward and I turned in that direction." Hetty modulated upon her return to-day.

"I got a lift from KDKA's carrier wave here and rode smoothly across 9 WZ's wave and ran into a whole flock of the Egyptian Radio Bugs in Marion. I listened for a while and saw them laying dark plans to mobilize the whole flock and move in formation on the Radio Show at St. Louis this fall. They are a live gang, these nights of the Sacred Scarab. In addition they are preparing to organize the whole Egyptian territory."

Hetty left 9 WZ's wave here and climbing up to 360 she caught the full effect of WKN, and in one 1300th part of a second found herself in the presence of 9 BVW in Webb City, Missouri.

Right here she found another argument against the spark transmitter. 9 BVW was raising so much fuss with the outfit as he swung the 2s, 5s, and 8s into line for card mailing that the paternal side of the house threatened demolition of the whole ding-busted business and all was closed down.

"I had a heck of a time getting out of there with my last resources blasted," said Hetty, "but thank my royal wave meters, I just managed to hook onto 9 SN who was working clearly away down the scale, and by a wee bit of tackling at the right time I hove into St. Louis after a delay of only one and one-third seconds."

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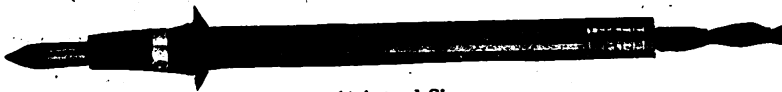
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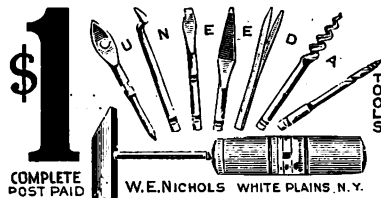
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Robert Mackay Fred. Chas. Ehler

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Receipt by new subscribers of the first copy of RADIO WORLD mailed to them after sending in their order, is automatic acknowledgment of their subscription order.

Advertising rates on request.

Entered as second-class matter, March 28, 1922, at the Post Office at New York, New York, under the act of March 3, 1879.

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While every possible care is taken to state correctly matters of fact and opinion in technical and general writings covering the radio field, and every line printed is gone over with a scrupulous regard for the facts, the publisher disclaims any responsibility for statements regarding questions of patents, priority of claims, the proper working out of technical problems, or other matters that may be printed in good faith and on information furnished by those supposed to be trustworthy. This statement is made in good faith and to save time and controversy in matters over which the publisher cannot possibly have control.

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KFBJ—Boise Radio Supply Co., Boise, Idaho.

WKAP—Flint, Dutee Wilcox, Cranston, R. I.

KFBK—Kimball-Upson Co., Sacramento, Calif.

WKAQ—Radio Corporation of Porto Rico, San Juan, P. R.

KFAY—W. J. Virgin Milling Co., Central Point, Oregon.

WKAG—Edwin T. Bruce, M.D., Louisville, Ky.

WJAZ—Chicago Radio Laboratory, Chicago.

KFBM—Cook & Foster, Astoria, Oregon.

WKAJ—Fargo Plumbing & Heating Co., Fargo, N. D.

KFBL—Leese Bros., Everett, Wash.

WKAH—Planet Radio Co., West Palm Beach, Fla.

WJAX—Union Trust Co., Cleveland, Ohio.

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THE Naval Radio Station at Cavite, Philippine Islands, now transmits directly to the Pacific Coast by means of a newly installed "barrage" receiver at San Francisco, thus covering a distance of about 7,000 miles without relaying. Previously trans-Pacific messages, eastward, were relayed from Cavite by Pearl Harbor, Hawaii. The new receiver, designed by the radio-research section of the Navy, is expected to save approximately \$20,000 a year in coal and power bills at Pearl Harbor as well as considerable time, and will also aid in clearing Pacific traffic. The perfection of the "barrage" receiver thus makes for far greater efficiency in Pacific radio circuits.

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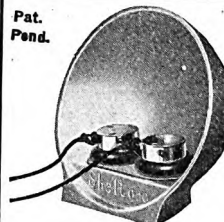
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Pend.



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3 Plate Variable Condensers \$1.50

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3000 Ohm Double Head Phones 6.00

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(Money back guarantee.)

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INTERURBAN BLDG., DALLAS, TEXAS

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All sizes cut as specified.

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52 Weeks for \$6.00

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Telephone—Canal 9475

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list of Amateur stations with names and ad-
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will refund postage on all mail returned as un-
deliverable if less than 98%. Remit with order.
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GOODMAN
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Tuner on the Market
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Send for pamphlet.
Order through your dealer.
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DREXEL HILL, PA.

Dr. Miller, of Chicago, writes: "My per-
fectly good variometers and vario-coupler
now go into the discard."

Radio Supplies
Variocouplers, Variometers,
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Guaranteed Crystal Set \$4
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Or Money Refunded PRICE,
Send fifty cents for 20 efficient blue-print
hook-ups.
Any Radio Set Made to Order
or Repaired
Sunbeam Electric Co.
71 THIRD AVE. NEW YORK

If you did not get copies of Radio
World, No. 1 to No. 21 send us \$3.00 or
we will send you this paper for one year,
(\$6.00 for 52 issues) and start it with our
first issue, which will be mailed you as
soon as possible after receipt of order.

Radio Aids Secretary Hughes

Will Keep in Touch with State Matters While on Voyage to and from Rio Janeiro

DURING his trip to Rio Janeiro, as the
representative of the United States to
Brazil Pan-American Exposition, Charles
E. Hughes, United States Secretary of State,
is in constant touch with his government
by means of a special radio-set installed in
his suite aboard the steamer "Pan-Ameri-
can."

Practically, the Secretary of State will
maintain a "floating department" through-
out his trip—although technically "at sea."
Official communications from the "Pan-
American" will be cleared immediately and
received with "right of way" either at the
Naval Radio at Bar Harbor or the Radio
Corporation's stations at Port Jefferson or
Riverhead, Long Island. Messages will be
forwarded from either the Naval Station
at Annapolis or commercial stations on the
coast.

The special radio-equipment, which was
rushed from Washington to New York by
a special messenger—who stored the ap-
paratus in an empty berth rather than trust
it to the baggage car—will be capable of
sending from Rio Janeiro to Bar Harbor. It
comprises a Federal Telegraph arc-trans-
mitter with universal amplifiers, used in con-
junction with tuners consisting of three
stages of radio amplification and an audion
detector with two stages of audio amplifica-
tion. This set is capable of using wave
lengths varying from 150 to 30,000 meters,
but, probably, about a 2,400 wave-length
will be used for transmission. In sending,
the shore stations will use longer wave-
lengths, possibly as high as 9,100 meters.

The steamer "American Legion" on which
Secretary Hughes will return, has also been
equipped with similar radio-apparatus so he
will be in constant communication with
the State Department on the home voyage.

Radio in Literature

BOTH publishers and authors are bank-
ing on the belief that radio will aid their
crafts and bring more books and magazines
to the evening lamp, because it keeps the
family at home, says John Walker Harring-
ton in "The Times," New York. Therefore,
for the present, they are appearing in the
broadcasting programs without charge.
The indications are, as far as the present
state of radio-telephony is a guide, that this
is a good theory. Certain works of lighter
literature have received direct promotion in
this way, for many wireless enthusiasts, af-
ter they have tried to see in their minds the
characters of their favorite fiction, want to
glance at the illustrations and confirm their
suspicions.

The owners of the broadcasting stations
respect the rights of authorship in every
way and do not have distributions of literary
wares without the permission of the authors
or the publishers. As the radio receivers are
manned by curious human beings who have
a deep interest in hearing the voices of
well-known persons, comparatively few of
the stories and poems and tales which now
are thrust into the ether are released by any
other than their producers.

First Radio Song Arrives

RADIO songs, we are informed, will
be plentiful this fall. The first to
reach "ye editor's" heavily burdened desk
is "Over the Radiophone" music by William
F. Holliday; words by Richard W. Pascoe.
It seems to have considerable lilt and charm,
and a real southern melody. Just the sort
of a song to add a little variety to a radio
evening.

Subscribe for RADIO WORLD. \$6.00 a
year, \$3.00 six months, \$1.50 three months.

Learn to Receive Code Messages Standard Regulation U. S. Army Field Message Book

Purchased from Signal Corps, U. S. A.
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CONTAINING:

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INTERNATIONAL CODE

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An accurately made, fully efficient instrument that
cannot get out of order or adjustment. Fully
guaranteed. Extra heavy aluminum plates. Con-
densed end pieces. All other parts heavily nickel-
plated. Knob and pointer included.
Furnished assembled or knocked-down
at the following low prices. Ready
assembled by anyone following in-
structions furnished. Save money—
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3	.00007	\$1.75	\$1.50
11	.00025	\$2.50	\$2.00
21	.0005	\$3.25	\$2.50
43	.001	\$5.50	\$2.50

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At \$1.00 per Roll

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TYPE CF-3 AMPLIFIER

THE PAN-AUDIO Three Step Amplifier was designed
by expert radio engineers for those who demand the
maximum of high frequency, scientific construction,
appearance and workmanship in radio apparatus.

The PAN-AUDIO is absolutely free from all howling and
distortion. Unlike the average amplifier, it reproduces
speech in natural tones, every word of which can be clearly
understood.

The PAN-AUDIO Amplifier provides a high class radio
output, noted for its simplicity of operation, easiness of
tune and handsome appearance. It is the ideal set for
receiving the broadcasting of music, lectures, concerts, time
signals, news items, stock reports and weather forecasts.

The PAN-AUDIO is made of solid mahogany, hand
rubbed to a furniture finish. The panels are of best
grade bakelite, carefully engraved, with nickel-plated bind-
ing posts and invisible wiring. May be used with any
type of receiving set.

Ask your dealer to show you the
PAN-AUDIO today. If he hasn't got
it write us direct for illustrated litera-
ture and full details.

The Wireless Appliance Corporation
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The rate for this RADIO WORLD QUICK-ACTION CLASSIFIED AD. DEPT. is 5c. per word (minimum of 10 words, including address), 10% discount for 4 consecutive insertions, 15% for 13 consecutive insertions (3 months). Changes will be made in standing classified advs., if copy is received at this office ten days before publication. RADIO WORLD CO., 1493 Broadway, N. Y. C. (Phone, Bryant 4796.)

Manufacturers of Rogers Radio Receivers and Rogers Receiving Radiometers. Rogers Radio Company, 5133 Woodworth Street, Pittsburgh, Pa.

TO THE TRADE—Fixed Phone and Grid Condensers. Write for price list and sample. **SALKEY RADIO CO.**, 2378 Eighth Ave., New York City.

WANTED

Representatives in the South and Middle West to handle our line of condensers and dials. **Bunting Stamp Co.**, 713 Liberty Ave., Pittsburgh, Pa.

PATENTS—Electrical cases a specialty. Pre-war charges. **B. P. Fishburne, Registered Patent Lawyer**, 386 McGill Bldg., Washington, D. C.

Exchange jolly interesting letters through our Club! Stamp appreciated. **Betty Lee**, 4254 Broadway, New York City.

CRYSTAL DETECTOR SET, from aerial to phones, complete. Big bargain. Send for circular. **Salkey Radio Co.**, 2378 Eighth Ave., New York City.

Triple mounted SHAMROCK CRYSTALS—50 cents—galena, silicon and iron pyrites mounted in one. Will fit any standard detector cup. Tested and sold under replacement guarantee. Mailed to any address on receipt of price in coin. **Bathgate**, 120 Autumn St., Passaic, N. J.

PATENTS

Protect your invention today. Write for 1922 Illustrated Book Free. Radio, Electrical, Chemical and Mechanical experts. Over 30 years' experience. **A. M. Wilson, Inc. (Radio 3 ARH)**, 310-18 Victor Building, Washington, D. C. (Successors to business established 1891 by A. M. Wilson.)

CASH FOR OLD GOLD. Platinum, Silver, Diamonds, Liberty Bonds, War, Thrift, Unused Postage Stamps, False Teeth, Magneto Points, Jobs, Any Valuables. Mail in today. Cash sent, return mail. Goods returned in ten days if you're not satisfied. **OHIO SMELTING CO.**, 337 Hipodrome Bldg., Cleveland, Ohio.

High Grade Antenna Wire. Best quality 7 strand No. 22, tinned copper, non-corrosive antenna wire. Only 1c. per foot. **The Kehler Radio Laboratories**, Dept. W., Abilene, Kans.

WANTED

Representative for New York district to handle our Vernier-variable condenser made by the **Bunting Stamp Manufacturing Co.**, 713 Liberty Ave., Pittsburgh, Pa.

BOYS—Write for our offer whereby you can secure a complete Audion Bulb Outfit and Amplifier FREE. **LEE RADIO CORPORATION**, Haddonfield, N. J.

FORMS for winding spider-web coils, especially adapted for panel mounting, 3 for \$1.00. **Clarence Johnsen**, 2051 North Cicero Ave., Chicago.

BLADES SHARPENED—Single edge, 2c.; double, 3c. **New York Edge Co.**, Glen Cove, N. Y.

FOR SALE—Radio set consisting of tuner, detector, and one-step, beautifully mounted on panel and engraved dial; includes three tubes and Baldwin loud speaking phones. First check for \$70.00 takes entire equipment. **R. W. F.**, 64 Hinsdale Place, Newark, N. J.

Dealers and Salesmen wanted to handle **Shamrock Crystals**. See other ad. Good proposition to dealers. Send 50 cents for sample. **Bathgate**, 120 Autumn St., Passaic, N. J.

REGENERATIVE RECEIVER, detector and two-step amplifier for sale. Price, complete, with A-P tubes, \$75.00. Receiver guaranteed. **E. Noble**, So. Brownsville, Pa.

DON'T BUY A BICYCLE MOTOR ATTACHMENT until you get our catalog and prices. **Shaw Mfg. Co.**, Dept. 71, Galesburg, Kan.

BOYS AND GIRLS EARN CHRISTMAS MONEY Write for 50 sets **AMERICAN CHRISTMAS SEALS**. Sell for 10c. a set. When sold, send us \$3 and keep \$2. **Neubecker Bros.**, 961 E. 3rd St., Dept. 64, Brooklyn, N. Y.

Radio Will Make the Movies "Speak"

Lee de Forest's "Phonofilm" Photographs the Voice and Reproduces It by a Converter and Telephone Amplifier

CHARLES GILBERT, president of the De Forest Telephone and Telegraph Company, announces that he has received a letter from Lee de Forest explaining that the phonofilm, Dr. de Forest's invention by which the persons appearing in moving-picture productions may actually speak to their audiences, has been made possible by the audion lamp—the three-element vacuum tube now used in radio—on which Dr. de Forest took out patents in 1906. "In the talking picture," said Mr. Gilbert in an interview with "The World," New York, "the sound waves (the voice of the actor) are translated into electrical waves. The electrical waves are translated into light

waves, and these are recorded on the edge of the film.

"In reproducing the picture the light waves are translated back into electrical waves, which waves are translated back into sound waves, and these are amplified with loud speakers placed near the screen for the audience.

"The whole process is performed in the audion tube, which is exactly the same tube employed in radio, except that the elements may be larger or smaller, as required by the individual operation."

Lee de Forest has been working on this revolutionary invention for over three years. He has used standard moving picture cameras and projecting machines in his experiments. It is predicted that the new invention will not only revolutionize the motion picture industry but will surpass even the adaptabilities of the radio telephone. He recently gave a successful exhibition in Berlin.

After a motor tour of Austria, Dr. de Forest will bring his phonofilm to America.

How One Newspaper Broadcast the Leonard-Tendler Fight

IT was the first time in the annals of the sporting world that an attempt has been made to cover an event of this magnitude by radio, says "The Record," Philadelphia, in describing how the Leonard-Tendler fight was broadcast to waiting thousands of spectators. By this arrangement the details of the fight were received and broadcast as fast as they happened. The sporting editor's room of "The Record" was transferred into a temporary broadcasting studio, where, by the use of a microphone connected with a special cable of the Bell Telephone Company, the bulletins and detailed information from Jersey City were relayed into the powerful transmitting station of the Philadelphia Radiophone Company, known as WCAU, and the amplifier in front of "The Record" office.

From WCAU station it was "laid on the air" for the benefit of the many stores, hotels, clubs and theatres that had arranged to receive the news and deliver it to all listeners. The same process was followed in city and country within the radius of 800 miles, and it was estimated that more than 500,000 people received "The Record" fight reports simultaneously.

At the broadcasting station word was received that the details of the fight had been picked up and heard distinctly at points in western Kentucky, Michigan and southern Alabama.

NOW THAT YOU ARE BACK FROM YOUR VACATION—

Be sure to see that your file of **RADIO WORLD** is complete. There will soon be so great a demand for back numbers that the supply will not be sufficient to cover it. **RADIO WORLD** has been issued every week from April 1 to date (22 numbers up to August 26th issue). Mail, postpaid, for 15c a copy; any seven copies for \$1.00. The first 22 copies sent on receipt of \$3.00. Or send \$6.00 for one year (52 issues) and have your subscription start with No. 1.—**RADIO WORLD**, 1493 Broadway, New York City.

WARNING TO OUR READERS!

RADIO WORLD accepts subscriptions thru the American News Co. and its branches, the regular news trade and subscription agencies. No others have any right to solicit or to accept payment for subscriptions unless they can show a properly signed subscription authorization from this publication.

RADIO WORLD, 1493 Broadway, N. Y. C.

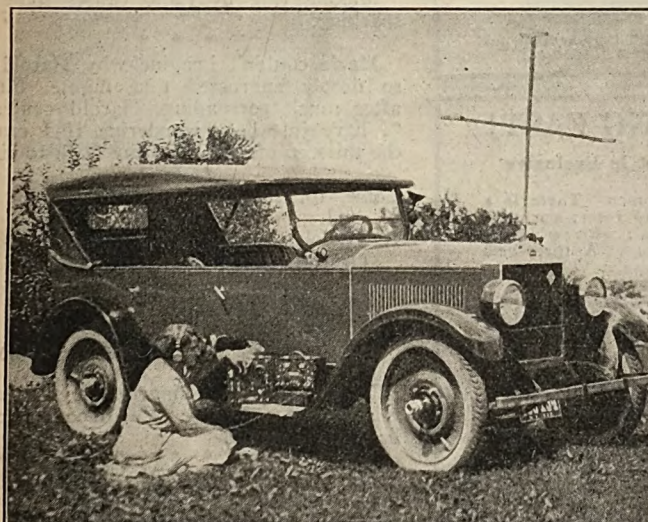
RADIO WORLD

Entered as second-class matter, March 28, 1922, at the post office at New York, New York, under the act of March 3, 1879

I L L U S T R A T E D

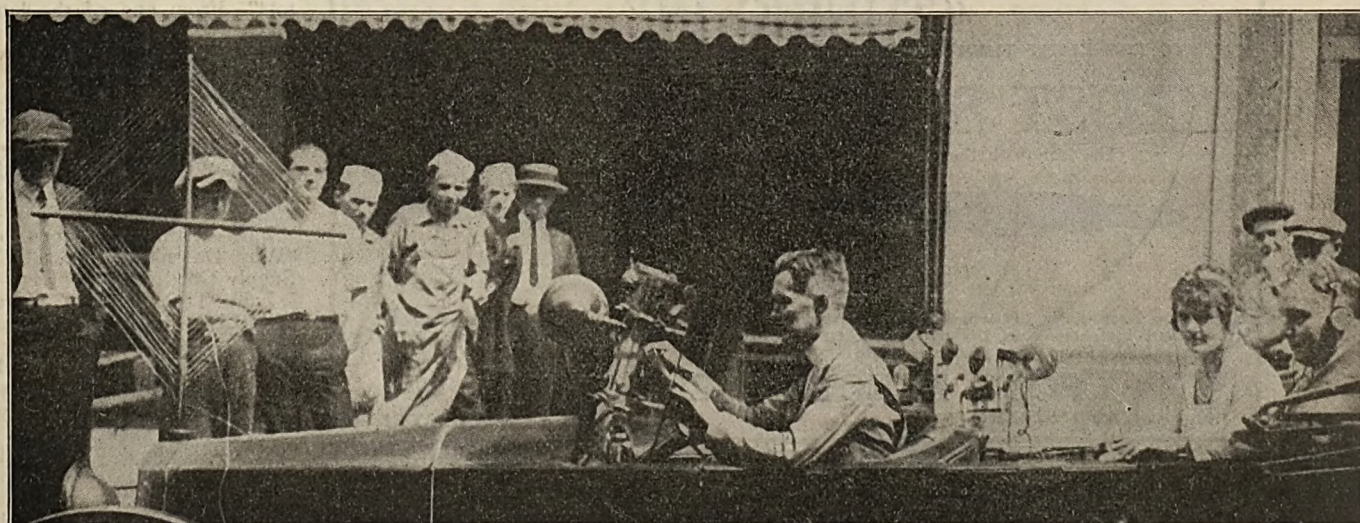
The Radio Summer of 1922

See
Inside



It brought cheer to the motorist, and kept the camper in touch with home.
(C. Kadel & Herbert.)

And this motorist, journeying across continent, heard Newark while driving through Chicago.
(C. International News Reel.)



HOW TO MAKE A PRACTICAL WAVE-METER

See
Page 4

New ABC Tuner—Ideal for Popular Broadcast Reception

After careful study of the demands of radio enthusiasts, Professor Morecroft, of Columbia University, has designed the ABC Tuner No. 5750, to fit into the ABC Standardized Radio Units System.

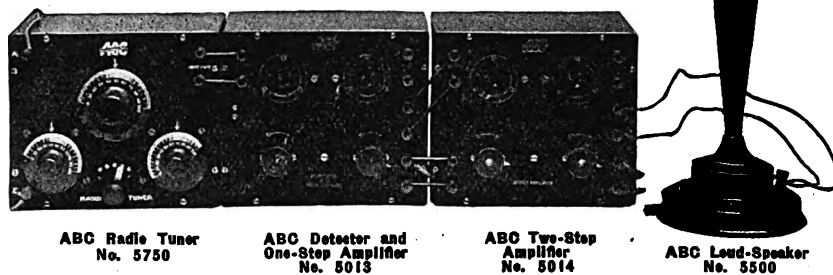
ABC Tuner No. 5750 has for its principle feature a very efficient vario-coupler of radically new design, together with two ABC 21-plate condensers.

The perfect hookup of ABC Units is illustrated below. With ABC Units the user builds his station to any desired capacity at minimum expense.

Write for latest ABC Catalog
and name of nearest dealer.

Jewett Manufacturing Corp.

342 Madison Ave. (Dept. G. 9), New York



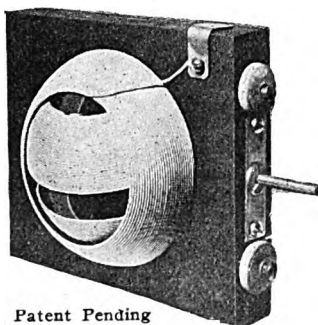
ABC Radio Tuner
No. 5750

ABC Detector and
One-Step Amplifier
No. 5015

ABC Two-Step
Amplifier
No. 5014

ABC Loud-Speaker
No. 5500

RADIOMART VARIOMETERS ARE SELLING FAST!



Patent Pending

The Design Is As Efficient As It Is Exclusive

Such is the VERDICT of all radio men. There is a minimum clearance between stator and rotor; our process makes the coils as strong as metal; with no dielectric losses; nickel plated brass bearings. A three-inch dial will cover the two mounting screws.

RADIOMART variometers are best for 3 circuit and single circuit receivers. Wave length, 150-600 meters. They are the neatest and best shaped variometers made anywhere. Satisfaction guaranteed.

Price, \$5.00 prepaid. Cash or C. O. D.

Our Literature is Free!

More Dealers Wanted!

RADIOMART CO.

1230 American Ave.
Long Beach, Calif.

"TUNING IN"

TO THE RIGHT TUNE IS VERY SIMPLE WHEN YOUR CONNECTIONS ARE
SOLDERED WITH THE NEW

"POST SOLDERING IRON"

(The Iron with the Platinum Heating Unit). Removable Soldering Tip



1/2 Actual Size
LIST \$6.00

Designed especially to cover every requirement for delicate work. The smallest practical, efficient instrument on the market. Attaches to any socket. Universal current. Fully guaranteed. From your jobber or write

POST ELECTRIC COMPANY

30 EAST 42ND STREET

NEW YORK

A Fitting Birthday Present for Those Interested in Radio

Are you cudgeling your brain in an effort to think of an appropriate present for a relative or friend? If that relative or friend is interested in radio, WHY NOT SEND HIM OR HER RADIO WORLD FOR THE COMING twelve months? Send us \$6.00 for each subscription you want, and we will place the names on our subscription list for one year, postpaid, and we will also send special cards to the addresses you send us announcing that the subscriptions were sent with your compliments.

Address Subscription Department, Radio World, 1493 Broadway, New York City, N. Y.

The Radio "Colyum"

STORY from the West tells of a boy who used his mother's clothesline for a counterpoise. When mother got a shock, boy got a spanking for putting up telephone wire instead of regulation rope. As Clare Briggs would remark: "That's when a feller needs a friend."

* * *

When Man bought the Radio and added a Loud Speaker, his Wife quickly got a divorce. She couldn't stand the competition.—"The Globe."

* * *

We were "C-Qing" for something to print when along comes California "Radio" with the following:

THE CQ HOUND

Listen, old-timers, and your fones will re-sound

With the terrible squeal of the CQ hound, Whose sending won't stop for fire or flood, Though every old-timer thirsts for his blood.

It's always, "Hello, and how am I now?" and "QSU now, for it's time to chow." He is always on deck, though "QTC NIL,"

His message read, "Is this you or Bill?" Oh! For his presence and a huge retty-smitch,

A double-barreled shotgun, a barrel of hot pitch.

That never again could we hear that sound, The eternal squeal of the CQ hound.

* * *

Culture, spelled with a 360-meter wave length, is the sugar-coating by which radio will be prescribed in liberal doses.

* * *

Making love by radio causes some fast sparking.

* * *

Mazie couldn't imagine why Harold was so deeply engrossed that night. Finally, after much persuading, Harold confessed: "I have just been wondering if I can get the thirteen messages off my hook to-night."

* * *

Come, for the night is falling,

And my set is tuned so fine It will pick up a peal of thunder Or the red ant's plaintive whine.

Come! And sit close beside me.

My head-phone's built for two.

It will be a night of rare delight—

With the world's wild sounds—and you!

* * *

Minnesota couple married by radio already want a divorce. Old Doc Static will be blamed again.

* * *

"Just as her jewelled hand grasped the knob of the variometer—crack! Harold Armitage had pulled the trigger of his pistol!"—From one of the latest fiction bromides.

And printed here to prove that its getting into our best sellers.

* * *

Our Own Broadcasting Station

OUCH for week beginning September 11 7:00—Fishing stories by the president of the Anglers' League. Limited to five minutes.

7:06—Unanswerable question No. 4-11-44: "Why Doesn't the Post Office Department Supply Good Pens?"

7:30—That Early Morning Lullaby: "Oh, Listen to the Milkman's Silent Tread!"

7:42—Our idea of nothing to do: Sharp-ening the fire axes in hotel hallways.

8:00—Jaspers we'd like to exterminate: 1—Those who are always exclaiming: "Ain't it the cat's meow!"

8:16—Reading: "A Million Ways to Make a Million." From the library of a bootlegger.

8:30—Dr. de Forest's photofilm exhal-ing the latest echoes of the Soup Eaters' Alliance.

8:57—Life's greatest lament: Getting sea-sick at the three-mile limit.

9:00—Correct time from the Alarm Clock Trust.

ROBERT MACKAY.

RADIO WORLD

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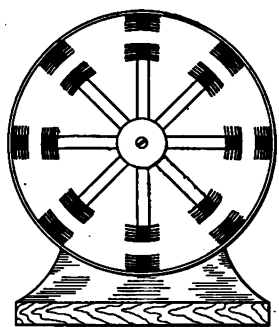
Vol. 1, No. 24

September 9, 1922

15c. per copy, \$6.00 a year

Radio Ideas for the Amateur to Test Out

By Carl Masson



ROTARY-QUENCHED SPARK GAP

FIGURE 1

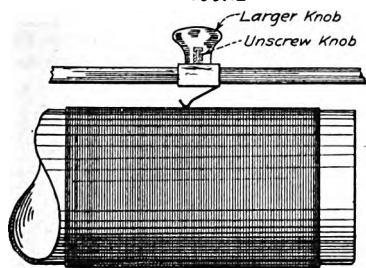
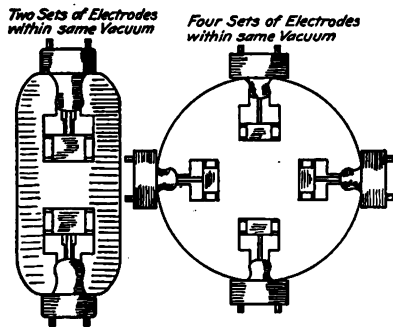


FIGURE 3



"AMPLITUDES"
FIGURE 5

THOUGH radio manufacturers have reached a high degree of efficiency in designing their instruments and outfits, there always will be many opportunities for improvement. Offering this as an excuse, the author presents the following original ideas:

The other night, I was running the rotary (ash sifter) when I noticed a photograph of a quenched spark-gap in a nearby catalogue. I immediately wondered why the two could not be combined. A pencil and paper, plus the author, resulted in Figure 1, illustrating this article. By mounting a series of small metal-discs on each of the electrodes, we have a double effect, producing clearer signals.

Now that I have given "ye olde-

time" transmitters a kink, let me turn to the receiving end of the game. Starting with the beginner, here is a novel idea for a crystal detector:

The cup in which the mineral is contained is a very coarse means of contact, considering that the detector is about the most flexible part of an outfit. What would happen if we used the same means of taking from the mineral what we put into it? That is, employ two cat's whiskers as shown in Figure 2. By means of this little change we can reach the sensitive veins of the mineral. Because of the patience it requires to adjust this type of detector, I would recommend that when once a sensitive position is secured, the cat's whiskers and mineral should be "sealed in" with beeswax or battery wax. Thus we have a detector that is quite efficient.

Because of the thousands of radio beginners, our manufacturers are finding a new demand for tuning coils. Having one of these coils in my circuit, and finding the sliders rather uncomfortable to adjust, I thought it indeed queer that—though tuning coils have been produced for over ten years—our manufacturers have invariably insisted on placing tiny, "pinch-penny" knobs on the sliders. Having some old lever-switch knobs in the house, I unscrewed those already on the sliders and made the change to the larger ones. See Figure 3. This makes the coil easier to adjust.

In the newly designed outfits, I have noticed it has become quite customary to provide control entirely by dials. However, very few attempts have been made to control a lever switch by means of a dial. An exceedingly simple idea of the author's is to fasten the switch lever to the back of a numbered dial, and space the taps in conjunction with the reading. See Fig. 4.

Speaking of the high costs of vacuum tubes, here is an idea *de luxe* for use in audion amplifiers of two stages or more. It is claimed by manufacturers that the most expensive work in the process of manufacturing vacuum tubes is securing the vacuum. Is there any reason why several filaments cannot be contained in the same vacuum? By mounting each filament at 90 or 180 degrees to the others, it will be possible for each set of elec-

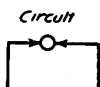
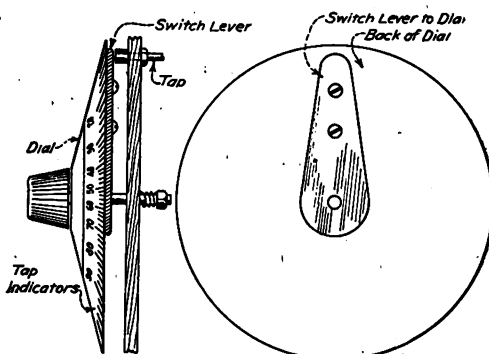
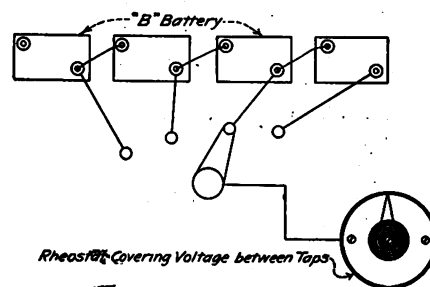


FIGURE 2



DIAL - SWITCH
FIGURE 4



"B" BATTERY CONTROL
FIGURE 6

trodes to function properly without interference. The accompanying illustration shows this idea. The two-filament amplitude should prove of value.

Now, in regard to B batteries, here is another tip which will put more flexibility into vacuum-tube reception. Of course, it is understood that in connecting a rheostat in direct circuit with B batteries, considerable current is unnecessarily wasted. Therefore, the tapped method is more favorable though no maximum of adjustment is obtainable. But suppose that after we had done our best with the taps, we connected into the circuit a rheostat of sufficient resistance to reduce the voltage of the entire battery the amount of the voltage of the difference between taps? In this way we can use any fraction of the entire battery. See Figure 6.

TTFA

How to Make a Practical Wave-Meter

By Frederick J. Rumford, E. E., R. E.

THE wave-meter is one of the most essential pieces of apparatus in radio science; but it is seldom found in the average amateur's equipment. One of the chief reasons for this omission is its high cost. Its uses are various, but its most essential purpose is for the calibrations of transmitting outfits and to determine the resonance, or wave-length, of a definite value.

A great many problems of the radio experimenter would be easily and immediately solved if he would buy or construct himself a wave-meter with a suitable range, as he could determine to his own satisfaction whether or not he had his apparatus, or antenna, working in accordance with the government's radio restrictions.

The amateur or experimenter will find that it is not such a difficult job as he probably thinks to build or design a wave-meter suitable for his immediate needs; but unless he can borrow for comparison a calibrated instrument, this wave-meter will be of no value to its builder. It is advisable for the amateur to calculate his own curve; but it will not be found that the curve calibrated in Figure 4 is accurate as there will be a variance in the curve with the different condensers that the amateur may wish to use.

The wave-meter described below has certain advantages in its favor—namely: simplicity, compactness and efficiency. The parts necessary for its making may be found in the workshop or laboratory of the average amateur. Particular care should be taken in selecting a condenser which should have a maximum capacity of .0005 microfarads. Such a condenser may be purchased at a small cost; but the amateur should be certain to purchase a standard condenser made by a reliable firm.

Figure 1 represents the top of the wave-meter assembled, showing the position and the location of the different parts with correct dimensions.

Figure 2 shows the front view with the coil located on the left-hand side of case. This figure also shows correct dimensions and locations.

Figure 3 shows general hook-up of the completed instrument.

Figure 4 is the calibrated curve.

Figure 5 shows the means of hooking in the audion.

Figure 6 shows the uni-polar connections.

Figure 7 shows the method of connecting a two-volt lamp in the meter circuit.

The panel should be $6\frac{1}{2}$ inches in length, $5\frac{1}{2}$ inches in width, and $\frac{1}{4}$ -inch thick. It is advisable to use bake-

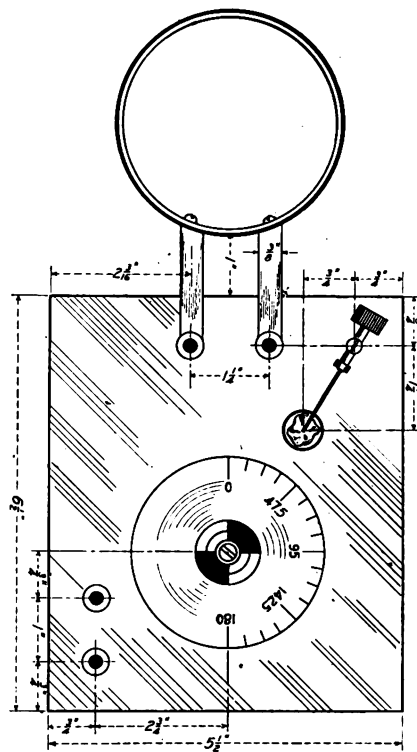


Figure 1 represents the top of the wave meter, assembled, showing the position of the coil and parts with correct dimensions. Suggested by Frederick J. Rumford. Drawn by S. Newman.

lite in the making of this panel, because it is one of the materials that does not absorb moisture. The panel should then be drilled and rubbed to a smooth finish.

Four binding-posts of the ordinary receiving variety should be purchased, which are to be mounted in the holes drilled for them. It will then be necessary to obtain a galena crystal-detector. This detector should be disassembled from its base and mounted on the panel according to Figure 1. It is, however, not absolutely neces-

sary to have the galena detector, as, in fact, most any good rectifying detector will serve the purpose.

You are now ready to mount the condenser. As stated, the make of condenser is left to the amateur's judgment. He should attach to the condenser shaft a bakelite dial and knob, the dial to be 3 inches in diameter and with a graduation from 0 to 180 degrees engraved upon it. It would be advisable also to attach a long shaft, or handle, to the knob of the dial with a bakelite covering to act as an anti-capacity handle.

After the panel is assembled and proper connections made, according to Figure 3, it should be placed upon a suitable oak cabinet of a sufficient size to allow for mounting. This cabinet makes a much better appearance if it is stained, after being assembled, with some good mahogany stain. You may make a cover with hinges to close over the panel top or place a handle on the cover for convenience in carrying.

To make the inductance leads, take two strips of brass each three inches long by $\frac{3}{8}$ of an inch wide, and $\frac{1}{16}$ or $\frac{1}{32}$ of an inch thick. Bend them into shape so they will fit the contour of the coil. If brass is not easily obtained, copper or any conductive metal can be used. In the bending of these strips, one should bear in mind to have the bend so that it will place the coil just one inch from the edge of the panel. These strips should be drilled in both ends so they will fit over the binding posts and, also, be attached to the coil with small machine-screws and nuts. After this is done, it is advisable to have the strips nickel plated. As will readily be seen, the inductance of the leads can be overlooked as they are so short.

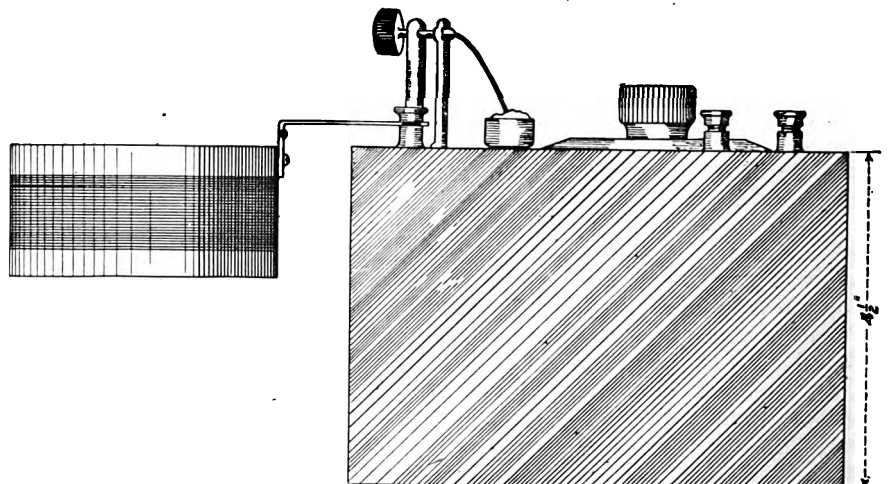


Figure 2 shows the front view with the coil located on the left of the case. This figure gives also the correct dimensions and locations. Suggested by Frederick J. Rumford. Drawn by S. Newman.

(Continued from preceding page)

The inductance coil will be wound upon a bakelite tube, $3\frac{1}{2}$ inches in diameter, $1\frac{3}{4}$ inches over all in length. Bakelite is the best material to use. This tube should have two holes drilled in it to allow for the attaching of the strips, the holes being drilled as in Figure 1.

About 23 feet of No. 20 D. C. C. magnet wire is needed, this wire to be secured firmly to the tube leaving a couple of inches of wire left over, which will be fastened, or soldered, to one of the strip nuts making a connection. The winding should be started in about $\frac{1}{2}$ inch and should be wound on the tube until there are 23 turns, which will occupy, approximately, 1 inch of winding. It should then be fastened as described above.

The amateur is especially cautioned not to use shellac, or varnish, on the winding on the coil as it would increase the capacity and throw it out of calibration. It is advisable not to wind this coil so that it will vary from an inductance of 65,000 centimeters. Provided you are not familiar with the use of the wave-meter, I will endeavor to explain briefly how to determine whether or not the wave-meter is at its point of resonance with the radio circuit you are measuring.

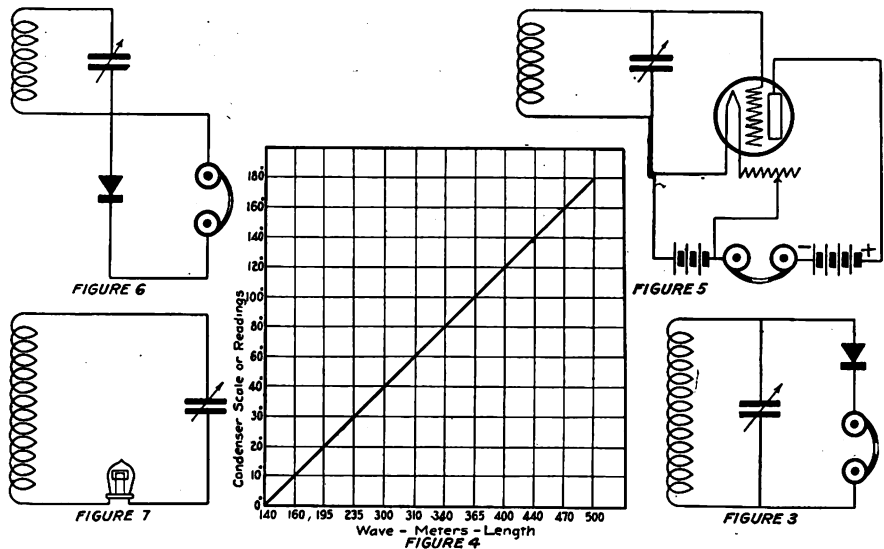
In Figure 3, the galena detector is connected in series with the receivers and is then connected in shunt with the variable condenser and inductance coil. The wave-meter should be placed near the transmitting circuit in operation and the capacity of the condenser is varied until the maximum sound is heard in the receivers; and, in turn, if the wave radiated by the transmitter is sharp and defined, close adjustment of the condenser is necessary to obtain a reading.

After the point of resonance is determined, the wave-length of the circuit will be obtained by referring to the chart, or curve, that the amateur has calibrated or calculated. It will not be necessary to have the detector and receiver connected across the condenser. They may be connected unilaterally, as will be seen by Figure 6. Connected like this, the detector and the receivers will not be apt to effect the constants of the wave-meter.

If the amateur, however, desires a more visible indication, a two-volt straight filament battery lamp should be connected in series with the inductance coil or variable condenser, as will be seen in Figure 7. This method is generally used when it is desirable to obtain spark-gap readings.

If, also, the amateur desires loud signals, he can connect his wave-meter as shown in Figure 5, the audion; that is, connecting one side of the condenser to the grid of a sensitive vacuum-tube.

A millimeter is frequently used as an indicating instrument, which should be connected in series with the con-



Figures 3, 4, 5, 6, and 7 are in this group. Figure 4 shows the plotted curve. The other schematic diagrams are various methods indicating how the wave meter may be connected. Suggested by Frederick J. Rumford. Drawn by S. Newman.

denser and inductance coil of your wave-meter.

When operating the wave-meter you should not fail to take into consideration the fact that if the meter is placed too near the circuit you are measuring, it will require readjustment, due to the fact that the oscillations from the transmitter are of too great a strength. This only will apply to very sensitive detectors, such as the galena or silicon. This, also, applies to the small battery lamp indicator. Also, if the wave-meter is placed too near the spark gap, the oscillations have such a strength

that they will burn out the filament of the small battery lamp, or may puncture the insulation on the inductance coil.

It is advisable to take several trial readings, and the coil should be placed so that it will be properly acted upon by the magnetic field of the radio-frequency circuit.

When a crystal detector is connected unilaterally to the wave-meter for determining the point of resonance, the wave-meter must be then placed nearer than it would be if it was connected in the regular manner—as shown in Figure 3.

The inductance coil of the wave meter is preferably placed nearer to the ground lead of an open oscillatory circuit when one is taking measurements of the natural period of the antenna. It is a fact that greater radiation will take place from an open oscillatory circuit of a radio transmitter than from a closed circuit of a radio transmitter. The wave-meter must be then placed at a greater distance than when making measurements of the closed circuit.

The different hook-ups I have explained need not necessarily be resorted to; but, however, in hooking up an instrument, if it is in your mind to place the wiring so it will be easily accessible, you may change over without much trouble to any of these various hook-ups.

If the experimenter desires, he may make up any number of these inductance coils, having a curve chart calibrated for each and every one of the different coils. The drawings and hook-ups are self-explanatory.

There are several other uses of the wave-meter, but this article covers in general the essential uses, and if the experimenter cares to follow closely the directions given for the construction, use, and operation of the wave-meter, it should prove to be not only a great help when completed but an interesting subject of experimentation.

Radio Electrical Units

RADIO waves are expressed in meters. A meter equals 3,291 feet. Prefixes are used in electrical terms because many electrical quantities are either very small or very large. Thus a microfarad is 1-1,000,000 of a farad, and megaohm is 1,000,000 ohms. Prefixes are: Milli (m), 1-1,000; centi (c), 1-100; deci (d), 1-10; deka (dk), 10; hekto (h), 100; kilo (k), 1,000.

There are four international units. The ohm, ampere, centimeter, and second.

The ohm is the unit of resistance and is that resistance offered by a column of mercury of uniform cross-section, 106.3 centimeters long and 14.4521 grams mass and at the temperature of melting ice.

The ampere is the unit of current and is that current which will pass through a silver nitrate solution and deposit silver at the rate of .0001118 grams per second. A gram is about one-twenty-eighth of an ounce.

A volt is the unit of electromotive force. It is the E. M. F., which will force one ampere of current through a resistance of one ohm.

A coulomb is the unit of quantity and is that quantity of electrical charge which may be stored or transferred by an ampere of current flowing one second.

A henry is the unit of inductance. The E. M. F. induced is one volt when the current varies at the rate of one ampere per second.

The watt is the unit of power. One ampere of current passing through a resistance of one ohm expends one watt of energy.

Class B Stations to Be Licensed

Department of Commerce Will Enable 400-Meter Wave Lengths to Hear without Interference

By Carl Hawes Butman

WASHINGTON, D. C.—The licensing of class B radiotelephone broadcasting-stations by the Department of Commerce under new regulations will enable those who desire, to listen in to the best stations on a special 400-meter wave without interference from some of the lesser lights in radio broadcasting.

But what stations will be selected? As the new regulations require a minimum of 500 watts in the antenna, with dependable and nonfluctuating power, special modulation, a studio, and a supervised program, using "canned" music only in an emergency or during intermission, it is not believed many of the 487 broadcasting stations can now meet the requirements. This will insure only the best and most dependable entertainment on this special wavelength, the bulk of stations continuing on 360 meters. Of course, the object is an effort on the part of the Department of Commerce to permit A-1 superbroadcasting stations to send without interference from the many stations using 360 meters, so that those fans who desire may receive high-class entertainment.

It looks as if stations maintained by Westinghouse, General Electric, American Telegraph and Telephone Company, and the Detroit newspapers would be among the first to qualify, but even they may have to make improvements and add to their equipment, while others will undoubtedly qualify, eventually as many as fifty stations may be licensed in class B.

Upon application through the nine district inspectors the department will license B stations as fast as they qualify, but probably not more than one in each city, or section, at first. In the event that two or more stations qualify in a single district, or neighborhood, where interference would occur, a schedule will be arranged dividing the time between them.

The B stations will have to toe the

mark in station efficiency and keep up to scratch on programs, the chief radio inspector states, or they will lose their special wave length and revert to 360 meters with the general broadcasting stations.

Public opinion will undoubtedly soon come to the aid of the inspectors and the department in case large numbers of broadcasters desire class-B stations, and public opinion will be the last court, basing its recommendations on the most interesting and instructive programs. Under the present law any station may qualify, but when requests get too thick, both in the general and class B field, the radio fans who listen in may have to aid officials in making selections.

As the general public is interested in broadcasting and the stations themselves will want to know the specifications for class B, the amended regulations are herewith given:

Amendments to Regulations

To Radio Inspectors and Others Concerned:
Regulation 57, page 55, amended August 8, 1922, to read:

CLASS 2.—Limited commercial stations are not open to public service and are licensed for a specific commercial service or services defined in the license. Stations of this class must not transmit to or accept public messages from other stations. No rates are authorized. Licenses of this class are required for all transmitting radio stations used for broadcasting news, concerts, lectures and such matter. A wave length of 360 meters is authorized for such service, and a wave length of 485 meters is authorized for broadcasting crop reports and weather forecasts, provided the use of such wave lengths does not interfere with ship-to-shore or ship-to-ship service.

Class B Radiotelephone Broadcasting Stations

A new class of radiotelephone broadcasting station-license is hereby established to be known as Class B.

A license will not be issued for a station in this class which does not comply in every respect with the specifications hereunder.

Specifications covering the requirements governing the construction, licensing, operating and service of Class B radio-telephone broadcasting stations:

Station

WAVE LENGTH.—The wave length of 400 meters only will be assigned for the use of stations of this class which must be reasonably free from harmonics.

POWER.—The power supply must be dependable and nonfluctuating. The minimum required will be 500 watts in the antenna and the maximum shall not exceed 11,000 watts in the antenna.

MODULATION.—The system must be so arranged as to cause the generated radio frequency current to vary accurately according to the sound impressed upon the microphone system.

SPARE PARTS.—Sufficient tubes and other material must be readily available to insure continuity and reliability of the announced schedule of service.

ANTENNA.—The antenna must be so constructed as to prevent swinging.

SIGNALING SYSTEM.—Some dependable system must be provided for communication between the operating room and the studio.

STUDIO.—The radio equipment in the studio must be limited to that essential for use in the room. The room shall be so arranged as to avoid sound reverberation and to exclude external and unnecessary noises.

Service

PROGRAMS.—The programs must be carefully supervised and maintained to insure satisfactory service to the public.

MUSIC.—Mechanically operated musical instruments may be used only in an emergency and during intermission periods in regular program.

DIVISION OF TIME.—Where two or more stations of Class B are licensed in the same city or locality a division of time will be required if necessary.

Forfeiture of 400-Meters Privilege

Licenses issued for the use of the 400 meters wave length shall specifically provide that any failure to maintain the standards prescribed for such stations may result in the cancelation of the license and requiring the station to use the 360 meters wave length.

(Signed) D. B. CARSON,
Commissioner of Navigation.

Approved.

(Signed) HERBERT HOOVER,
Secretary of Commerce.

These regulations are pertinent to all amateurs and should be carefully preserved by them.

In RADIO WORLD, No. 25, on Sale September 13

FREDERICK J. RUMFORD, E.E., R.E.

Contributes an Important Article on ARMSTRONG SUPER-REGENERATION.
Fully Illustrated. If you are interested in the Armstrong Circuit, Don't Miss It!

Jack Frost Begins to Shoo Static Off the Antenna



Cartoon by Walter Kinstler. Reproduced from "The Radio Globe," August 26, 1922.

Plans for New York's Big Broadcaster

THE specifications for New York City's big broadcasting station in the Municipal Building and its complete transmitting and receiving outfit have been made public by Grover A. Whalen, Commissioner of Plants and Structure. Bids for the work and material are now being considered. The new station, which will be one of the largest and best-equipped in America, is described as follows:

(a) "The radio telephone broadcasting of speech and music from a studio at the broadcasting station (Municipal Building)."

(b) "The radio telephone broadcasting of speech and music from points distant from the broadcasting station and involving the employment of wire lines between the point of input and the station."

(c) "The radio telephone receiving and high power telephone projecting of speech and music in open places and auditoriums."

(d) "The high power telephone projecting of speech and music from wire lines between the point of input and high power telephone equipment in open places and auditoriums."

(e) "The high power telephone projecting of speech and music from a

local microphone transmitter in open places and auditoriums."

(f) "The radio telephone receiving of speech in public offices."

The antenna is to be of the flat-top type of not less than four seven-strand No. 16 wires. It will be supported at the north end by a 100-foot tower and at the south end by the tower of the Municipal Building. The effective length of antenna is to be not less than 100 feet. It will be 460 feet above street level.

The following equipment will be installed:

One 500-watt radiotelephone broadcaster complete with receiving set.

Four receiving sets with loop antenna and loud speaker.

One high-power loud speaking telephone equipment with radio receiver, amplifiers for both distant and close talking and power units for both alternating and direct current.

One speech amplifying equipment, loud speaking telephone with battery power unit.

One speech input equipment, loud speaking telephone, with battery power unit; three speech input equipments.

The transmitter is to have a continuous wave-length adjustment from 300

to 600 meters, and is to be capable of modification, using the initial apparatus down to 275 meters. The vacuum tubes will be four 250-watt tubes and one 50-watt tube. The power for the transmitter will be obtained from a three-unit motor-generator set so designed as to reduce to a minimum commutation ripples.

The high-power loud-speaking telephone equipment, shall be adapted to the following purposes, namely: Local radio telephone receiving and high-power telephone projecting in open public places where an audience of approximately 100,000 persons may be assembled, or in large auditoriums; to high-power telephone projecting from wire lines in similar situations, and to high-power telephone projecting from local microphone transmitters, also in similar situations.

The speech input equipment for substations of the broadcasting station, to be installed by the city from time to time as the necessities for radiotelephone service may require.

Voice and instrumental music shall be broadcast under the same conditions for receiving to a level suitable for transmission over a Commercial telephone line.

A Peep Inside a Broadcasting Station

By Harold Day

EVERYONE who has listened to a program broadcast by radio has visualized the interior of the station sending forth the songs and speeches. One imagines, perhaps, a room full of apparatus—black panels, polished dials, delicate measuring-instruments, and the glow of vacuum tubes as the setting for the evening's prima donna. Were one to enter an actual "studio," however, he would find nothing in its soft carpet and attractive furnishings to suggest radio, except a small panel on the wall carrying a few signal lamps and push buttons, and, on a pedestal, a graceful metal object—the broadcasting microphone.

A well-designed studio begins with a room the walls of which are sound-proof and which will accommodate comfortably a chorus or an orchestra of twenty persons. Usually the walls

are draped with some heavy fabric, to prevent echoes, and for the same reason its grand piano, phonograph and tables are kept covered when not in use.

Since soloists are accustomed to standing on the hard floor of the stage, a low wooden platform is provided to make them feel at ease and to discourage them from moving about the room while singing. This is a common tendency among artists of strong dramatic instinct, but it is undesirable because it carries them away from the microphone that is to pick up their voices.

This platform is only one of the many little details provided for the comfort of the artists in a well-run station, say engineers of Western Electric Company. The studio itself is best located where it is easily reached from the street. On their arrival,

the performers are greeted in an ante-room by a courteous attendant and made to feel at home while they wait their turn to "go on." Shortly before each program, the studio manager explains the few simple points to be observed—such as remaining from four to eight feet from the transmitter, enunciating clearly, and maintaining perfect quiet while the microphone is "on the air."

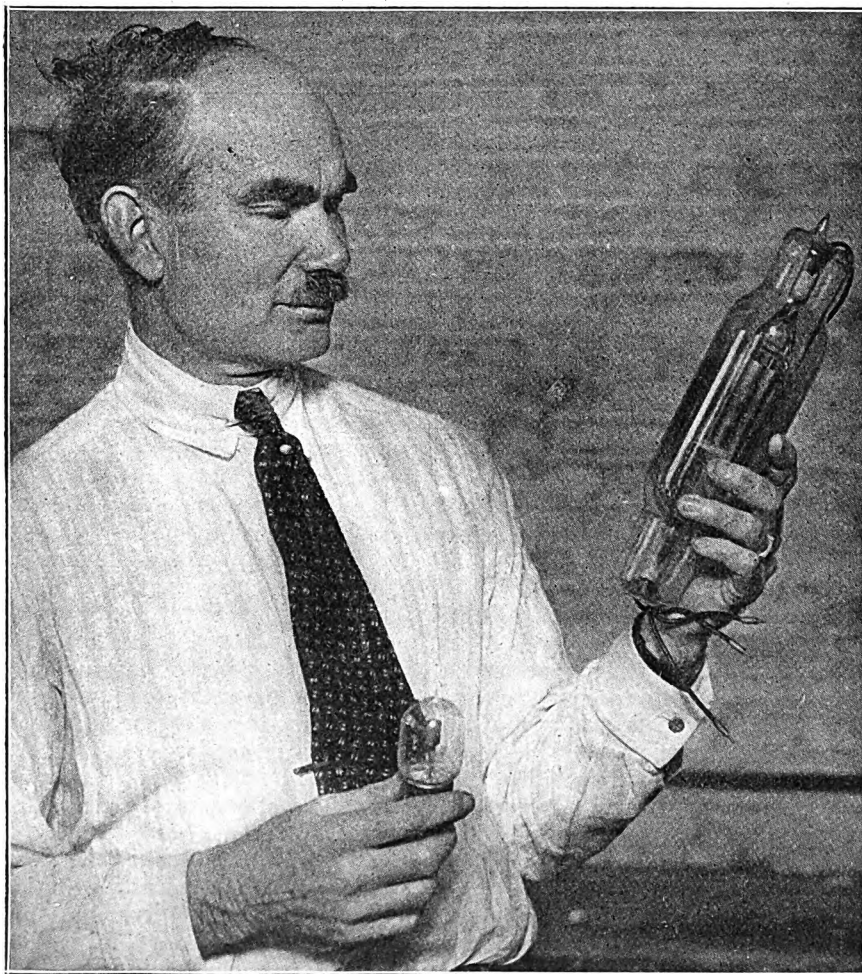
At length—the moment to begin! In the studio a lamp flashes, telling the manager that the electrical equipment is ready. With a last glance to be sure that everyone is in place, he throws a switch which connects the microphone through the set to the antenna, and in a strong, clear voice announces, "This is station PDQ broadcasting. We will have a solo by Miss B., entitled —" and so on! The pianist begins the accompaniment, and the "show" is on.

The curtain has now risen on an invisible audience of thousands; but with the exception of a bright blue pilot-light on the wall, nothing has changed in the studio. It is hard for performers to realize that they are not merely rehearsing, and sometimes to the chagrin of the manager, they interrupt themselves with a question about their singing or some other incongruous remark. One Western Electric engineer relates with glee how, one day, listening at the company's radio station to a tenor solo at another local station, he heard the singer ask at the conclusion, "How do you shut this — thing off, anyhow?"

Such situations the studio manager must handle "on the minute," diplomatically, for he is dealing with all sorts of temperament from the high-strung artist to the busy man of politics or affairs.

Rehearsals are held frequently during which the electrical equipment is connected to a dummy antenna. This permits various groupings of performers to be tried without disturbing other stations. During these tests and during the performance itself, the station operator must give close attention to instruments which show the performance of the microphone, the power which its circuit delivers to the transmitting apparatus, and the power radiated into space. The quality of the transmitted speech is observed by listening in with a receiving set. These precautions coupled with an experienced station-operator and first-class radio equipment are desirable to make sure that you, as a radio amateur, will hear a program that will repay you for listening in.

De Forest and His "Radio Bottle"



(C. Paul Thompson, N. Y.)

In his left hand, Lee de Forest is holding his newly developed oscillating audion, or "radio bottle," by which speech is carried on a small aerial, a low wave length, and one-third of a kilowatt of power from the de Forest station in New Jersey to stations in the Middle West. It is a device by which he expects to revolutionize radiotelephony. The instrument in his right hand is the small-type audion.

How to Make a Honeycomb Coil With a Two-Stage Amplifier

By Fred. Chas. Ehlert

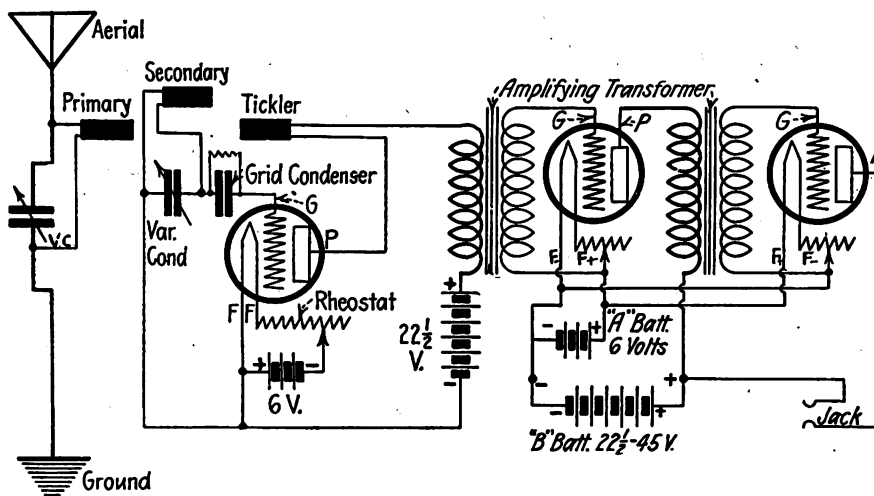
THE most important contribution to radio since the perfection of the vacuum tube is the Armstrong feed-back circuit. Were it not for Major Edwin H. Armstrong, radio enthusiasts would not be receiving the wonderful musical programs and other forms of entertainment that are now broadcast daily by hundreds of stations throughout the United States. Certainly an arc transmitter could be used; but the results that would be obtained from this machine would be so inextricably mixed up with hisses, clicks and howls that nobody would have the patience to listen to it.

Today, the finest receivers manufactured carry the Armstrong feed-back circuit and even the modern multiplex form of radiotelegraphy and telephony must pay tribute to Major Armstrong. The feed-back circuit is one of the most important, if not the most important, invention in radio. It is an invention of employing, in connection with an audion- or vacuum-tube, a coupling which enables a local battery to contribute its energy to the amplification of a signal received in a radio station.

One method of employing the feed-back circuit is shown in the accompanying schematic diagram utilizing honeycombs or duo-lateral coils as a means of inductance. A two-stage amplifier is also connected with the circuit. This makes a satisfactory circuit of a detector and a two-stage amplifier using honeycomb coils.

In this hook-up, three coils are used. One coil is used in the plate circuit of the detector. It is called the tickler coil. The other two are the primary coil and the secondary coil, respectively. A variable condenser having 43 plates of .001 microfarad capacity is placed in parallel, or shunt, to the primary circuit. Another variable condenser having 23 plates of .0005 microfarad capacity is placed in parallel, or shunt, to the secondary circuit. This will enable the operator to secure for himself selective tuning which sometimes is hard to find with the cheaper grade of sets.

It will be seen that the detector tube and amplifier tubes have their own A batteries and B batteries. The detector has a plate (B) battery voltage from 15 to 22 volts (variable), while the amplifiers have between 22 and 45 volts plate voltage. Separate A batteries are used to keep the strain off the tubes and give longer life to the



Schematic diagram utilizing honeycomb, or duo-lateral, coils as a means of inductance. In this hook-up, a two-stage amplifier is also connected with the circuit. This is worth testing out and should give the most satisfactory results. Suggested by Fred. Chas. Ehlert. Drawn by S. Newman.

storage battery. It also helps in giving clearer and louder signals.

Parts for this receiver may be purchased at most any radio shop and may be assembled quickly. Care must be exercised that the proper connections are made. Have all joints soldered,

keeping the leads and wires as short as possible. Satisfactory results should be obtained if this type set is employed. It can be made to use most any wave desired by merely shifting coils, which come in various sizes according to the desired wave lengths.

Table of Sparking Distances

In Air for Various Voltages Between Needle Points

Distance			Distance		
Volts	Inches	Centimeter	Volts	Inches	Centimeter
5000	.225	.57	60000	4.65	11.8
10000	.470	1.19	70000	5.85	14.9
15000	.725	1.84	80000	7.10	18.0
20000	1.000	2.54	90000	8.35	21.2
25000	1.300	3.30	100000	9.60	24.4
30000	1.625	4.10	110000	10.75	27.3
35000	2.000	5.10	120000	11.85	30.1
40000	2.450	6.20	130000	12.95	32.9
45000	2.95	7.50	140000	13.95	35.4
50000	3.55	9.00	150000	15.00	38.1

State Matters by Radio

Elaborate Service for Secretary of State Hughes on South American Trip.

ELABORATE arrangements were made by the Naval Communications Service for radio communication with Secretary of State Hughes during his voyage to and from South America. All naval radio stations along the coast and in the West Indies were notified to be on the alert. Messages to the vessels will be sent at certain hours through the Navy's high-power radio stations at Sayville, L. I.; Cayey, Porto Rico, and Balboa, Canal Zone.

All these stations were heard throughout the entire voyage from New York to Rio

de Janeiro, but to make the reception of important messages more certain they were first transmitted by Sayville, then copied and repeated by Cayey and then also copied and repeated by Balboa. In addition, the battleships "Maryland" and "Nevada" which accompanied the Shipping Board vessels, will also copy the messages and will relay them if necessary.

Messages sent from the ships were routed through the radio receiving stations at Bar Harbor, Maine, and at San Juan, Porto Rico.

American press messages were received direct aboard the ships each day of the trip and special arrangements were made with the Navy for handling interesting bits of information as to events aboard ship for the newspaper correspondents aboard.

The Radio Primer

A Weekly A. B. C. of Radio for the Beginner, in which Elementary Facts and Principles Are Fully and Tersely Explained and all Words and Terms Used by Amateurs and Experts Defined

The Beginner's Catechism

By Edward Linwood

WHY and where should we employ a variable condenser?

The short-wave condenser is used to establish resonance with wave lengths below the fundamental wave-length of the antenna. The variation of this condenser necessarily gives a small range of wave lengths, for it is not possible to reduce the fundamental wave-length of antenna by quite one-half with a series condenser. As an illustration: If the fundamental wave-length of an aerial is 600 meters, about the lowest wave-length that can be obtained then for practical working is about 350 meters. On the other hand, an antenna may be loaded by inductance to many times its natural wave-length. An aerial, the fundamental of which is 300 meters, may be loaded to 20,000 meters and will give good results from high-power stations provided a multi-stage tube set is employed. The condenser is always inserted in the primary lead in series with either the aerial or ground.

Why do they use taps on a vario-coupler and not sliding contacts?

The use of sliding contacts on tuning coils for inductance variation is not recommended because with continued use, the turns will be cut through, adjacent wires pushed together into direct contact and will result in a short circuit. Unless a variable condenser is placed in shunt with the primary coil, or in series with the antenna, a switch must be provided that will permit the antenna inductance to be varied by a turn at one time. Such a variation may be secured by a combination of units-and-tens switch. This is sometimes referred to as taps. Most vario-couplers to-day are made with the tap arrangement.

What is a potentiometer and what is it used for?

A potentiometer is an apparatus for measuring electric pressures. As a word, however, it never should have been used to define the variable resistance of a wireless set, since electric pressures, which are set up by the crystal, are not *measured* but simply *varied* to meet the needs of the detector. However, as the word is used

by all radiomen, right or wrong, we must accept it. The potentiometer is used in connection with a crystal set for applying, or superimposing, upon the crystal a battery current. Generally used with carborundum for louder signals.

* * *

Can an aerial be placed anywhere about a house, or is there a certain rule for its erection?

There are three things, practically, which tend to make a good aerial. These are: first, to have the wires as high as possible; second, to have the ends well insulated; third, to have as long a stretch of wire as possible. Always choose, if possible, two places as high as possible and as far apart as you can find, one of which is near the location of your set. Remember that there should be no trees or other obstruction to interfere with the aerial wires.

* * *

What is ground connection?

There is one thing that must be remembered always: Good ground must be used to place your radio station in first-class condition. To ground a set is to connect it with a sheet of metal buried in the ground; or with some metal object such as a gas pipe, a water pipe or any other metal connected directly with the ground.

* * *

What is the use of the variometer?

This instrument affords a means of obtaining a continuous variation of inductance and is, therefore, useful in radio circuits. The principal advantage that the variometer has over the ordinary variable-inductance is its absence of sliding contacts or complicated switch mechanisms.

The Radio Primer has been published regularly in RADIO WORLD since issue No. 1, and will be a regular department in order to instruct and aid the many thousands of amateurs who are joining the ranks of radio enthusiasts every week.

An Easy Way to Memorize the Continental Code

MERELY to memorize the system of dots and dashes that make up the Continental Code, without much practical experience, is useless. David P. Gibbons, in "Radio," San Francisco, realizing this has worked out a scheme which, coming from a practical radio man, may prove helpful to the amateur.

The manner of using it will be apparent after a brief study, Mr. Gibbons writes. For example, take the letter L. The word used is "linoleum," in which the letter itself occurs twice. The first syllable (lin) has a short accent, the second (ol) a long accent, and the two final syllables (e, um) short accents, hereby reproducing the dot-dash-dot-dot, which form the Morse character representing the letter.

Again take the letter Q. Here three words are used to obtain the proper accents and at the same time include the letter itself. The first two words (quite, queer) — of one syllable each — are long, the third syllable (in-) is short, and the final syllable (-deed) is long, thus giving the dash-dash-dot-dash, which represents Q in the code.

Similarly the connection between the other letters and the corresponding words will be seen on inspection, and the correct combination of SOUNDS for any given letter be more readily impress on the memory.

A Away - —
B By Billiken's - - - -
C Crowded Cloister - - - -
D Dangerous - - -
E Eggs -
F Fifi Foolish - - - -
G Good Gracious - - -
H Hilly Billy - - - -
I Izzie - -
J Jerome Jay Jones - - - -
K Kokomo - - -
L Linoleum - - - -
M Mile-long - - -
N Nailer - -
O Ozone blows - - -
P Persuades Peter - - - -
Q Quite Queer indeed - - - -
R Reported - - -
S Sensitive - - -
T Tube -
U Undertaker - - -
V Visible glow - - -
W With White Wire - - -
X Hoar silly jokes - - -
Y Yearly told yarns - - -
Z Zero weather - - -

If the student finds any particular difficulty in memorizing the various words selected he might connect them together to form sentences like the following: Away by Billiken's crowded cloister the dangerous eggs made Fifi foolish. "Good gracious!" said the hilly-billy to Izzie, "look at Jerome Jay Jones laying linoleum with a mile-long nailer, while the ozone blows and persuades Peter he is quite queer indeed, as it is reported that a sensitive tube will undertake to make a visible glow with white wire, but such hoax, silly jokes and yearly told yarns are a sign of zero weather."

Radio World's Hall of Fame



(C. Underwood & Underwood, N. Y.)

Dr. F. W. DUNMORE

F. W. Dunmore, radio professor, is one of the leading radio experts and experimenters of the United States. He is a member of the Bureau of Standards. Dr. Dunmore designed many radio devices now used throughout the world, including most everything from amateur sets to intricate and powerful receiving sets used in both branches of the National Service. One of Dr. Dunmore's recent developments was the radio suitcase which created a sensation when he demonstrated it before the Institute of Radio Engineers. Dr. Dunmore is the author of important articles on radio communication which are released through the Bureau of Standards. In co-operation with Dr. Kolster, also of the Bureau of Standards, he developed a number of devices to perfect the radio compass.

Perfect Short-Wave Radio-Frequency Amplification

By George W. May, R. E.

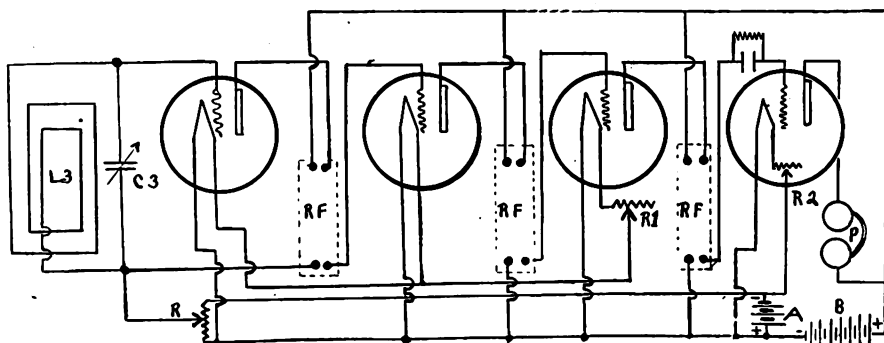


Figure 1—Schematic diagram of a three-stage radio-frequency set with detector. A loop aerial is illustrated with proper connections for batteries. Drawn by G. W. May.

I HAVE received a number of inquiries from readers of RADIO WORLD who are seeking further information regarding radio-frequency receivers for short wave-lengths. There is no doubt that radio-frequency amplification is the coming form of radiophone receiving. There is, also, no question regarding the increasing interest in the use of radio frequency. Here are four major questions which I will answer in this article:

What is radio frequency?

Has it any advantage over audio frequency?

How many methods are there for amplifying signals?

What is audio frequency?

These are important questions that seem to faze thousands of amateurs who are dabbling with radio-frequency receivers. Radio frequency acts in a way entirely different to audio frequency and it is therefore desirable to understand the function of each. There are practically two distinct methods of increasing, or amplifying, the strength of incoming signals in a radio-receiving set. The first method of audio frequency is a set employing one or more

tubes, whereby the incoming oscillations are first detected by the detector tube, then being submitted for amplification to the next tube, known as amplifiers. Each additional tube placed in the circuit is called a stage of amplification. If two tubes are used, it is

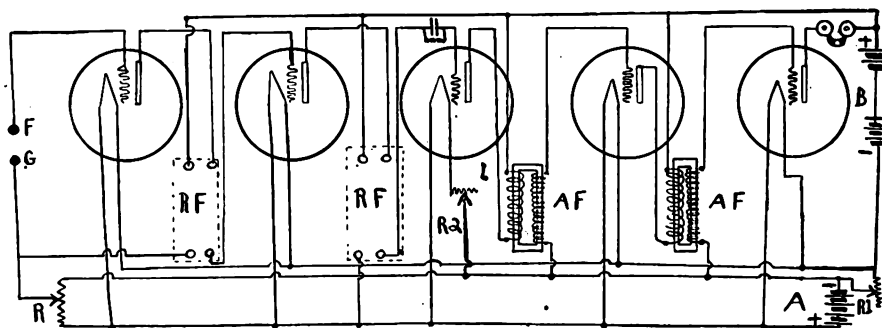


Figure 2—Schematic diagram showing two steps of radio frequency with detector and two stages of audio frequency for amplification. Drawn by G. W. May.

called a detector and a two-stage amplifier.

The next method is radio frequency which tends to build up the original signal frequency, or, in other words, to build up the weak impulses in the antenna circuit until the signal is of

sufficient strength for the detector to function. It is, also, a device for reproducing and magnifying a radio speech or signal wave.

Audio frequency should be used where loudness of signals is desired, while radio-frequency amplifier should be used where distance, or range, is wanted. The objection to radio-frequency amplification at this time lies in the fact that it is still in a state of experimentation so far as short waves are concerned. This is due to two facts: First, the amplification of radio-frequency amplification is extremely critical, particularly on short waves. Where we are dealing with current frequencies in the neighborhood of one million cycles per second. The second objection is this: On these short waves we are not really obtaining radio-frequency amplification, but regeneration due to the capacity effect of the vacu-

um tube itself feeding back into the coils of the so-called radio-frequency transformer. Another thing that has to be overcome in this type before it is successful is the development of a transformer that will function properly on short waves where the frequency is extremely high. The three circuits published herewith may be used with DX radio-frequency transformers. Care must be taken to select the right circuit.

In any case, the operation of radio-frequency is critical. This means that the utmost care must be taken in order to adjust the set for correct results. It is imperative, also, that all radio-frequency apparatus be carefully shielded; otherwise capacity body effects will prevent any suitable adjustment being obtained.

The successive stages of amplifiers may be coupled by transformers, by resistance, or by reactance coils, which are frequently known as choke coils.

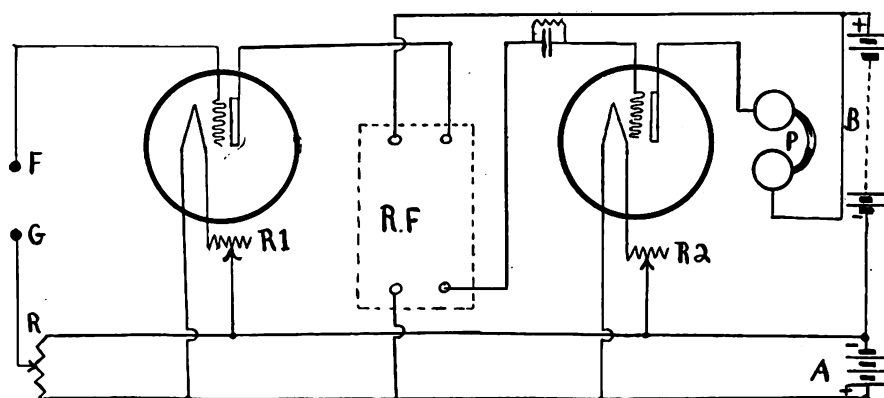


Figure 3—Single, or one step, of radio frequency with detector. The connections F-G are connections for the use with loop or outside aerial. Drawn by G. W. May.

How to Eliminate Tube Noises

YOU have undoubtedly heard the phrase "tube noises." This can be caused by a poor tube or by a tube that does not sit tightly in its socket or makes an imperfect connection on the base of the socket. This should be watched for very carefully. In fact, it may very often occur that an improvement in the reception can be obtained by switching the amplifier tubes around.

For detector purposes a soft tube is invariably recommended. In this case a great deal of attention must be paid to the amount of current in the plate circuit, as a soft tube is what is known as a "critical tube." This means that each tube will vary, and consequently require a different amount of voltage on the plate circuit, so that it is very necessary to have a B battery for the detector tube that is variable and will permit you to take off any amount of voltage. In no case should this voltage be more than a standard $22\frac{1}{2}$ volt.

While a soft tube cannot be used as an amplifier, a hard tube can be used temporarily as a detector.

This Typewriter Sends Radio Messages from Airplanes



(C. International.)

This is the teletype by which typewritten messages are sent from airplanes by radio to land stations. A most successful test was recently made by the Bureau of Standards, Washington, D. C. The teletype resembles in general the commercial typewriter, in that a keyboard having the alphabet and other conventional symbols is so arranged that it may be operated by hand. Each key is connected to the radio installation in the plane and when a letter is struck on the keyboard a radio impulse is sent out from the antenna of the plane and is received at a ground station.

(Continued from preceding page)

When transformers are employed only a slight stepping up of voltage is generally feasible on account of capacitance effects. Hence, transformers do not offer such advantages over resistance or reactance as they do in audio-frequency amplifiers. The inability to step up voltage between stages, together with the partial short-circuiting by capacitance, makes the amplification per tube less than in audio-frequency amplifiers; so more stages are needed in radio-frequency amplifiers to give the same over all amplification. The

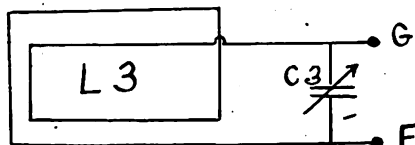


Figure 5—Loop aerial used with the D X radio-frequency transformers. Drawn by G. W. May.

effect of tube capacitance may be practically neutralized by employing transformers or coupling reactances that are tuned to the frequency of the incoming oscillations. The tuning may be made very broad, so as to amplify over a considerable range in frequency without the necessity for adjustment or it may be sharply tuned so as to increase selectivity.

Radio-frequency amplifiers, particularly those for very high frequencies, generally exhibit marked regenerative properties, due to inherent capacitance coupling between stages. Unless care is taken to minimize these coupling capacitances by separating the circuits and surrounding them with metal shields, the regenerative effect will produce a strong continuous oscillation that will interfere with the amplification.

In Figure 1 a drawing is shown of a three-stage radio-frequency amplifier with detector, showing also B-battery voltage adjustment on detector.

Figure 2 is a two-step radio detector and a two-step audio amplifier.

Figure 3 is a single-step radio frequency amplifier with detector.

Figures 4 and 5 illustrate the type of aerials used and shows how they should be connected. The outside aerial is shown, also the loop; but among all amateurs, the loop aerials are given preference as they eliminate much of the interference from other stations as well as the amateur's bugaboo—static noises.

In experimenting with either of these circuits it will be necessary to make all high-frequency leads as short as possible. The binding posts arranged for most direct connections when the transformers are mounted in the amplifier L and LI are honeycomb coils or other suitable inductances, C1, .0005 or .001 mfd, variable condenser, C2, .001 mfd., variable condenser, C3, .0005 variable condenser. L3, a loop aerial of 6 turns on 6-foot loop for 360 meter work. A is battery of 6 volts. B is a battery of 60 to 80 volts. RF is the radio-frequency transformers. The one potentiometer may be used to control the grid bias of the several tubes in a multistage amplifier. A filament rheostat in the positive lead is recommended. The diagrams show the proper hoop-ups for one- two- and three-stage amplifiers. These diagrams are also intended to show the actual physical positions of the various elements which should be followed. The arrangement of the tubes, transformers rheostats and wires should conform as closely as possible to that shown in the diagram.

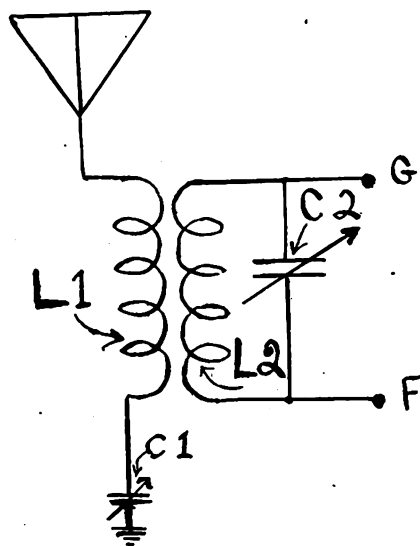


Figure 4—The outside aerial with vario-coupler and condensers which can be connected to either of the sets described. Drawn by G. W. May.

Radiograms

Latest Important News of Radio Garnered from the World Over, and Reduced to Short Wave-Lengths for the Busy Reader.

Radio is to be utilized in France to prevent waste. The price list on provisions in the Paris market is now broadcast from Eiffel Tower. This information is for farmers, orchardists, and stock raisers so they will know what supplies to send to the city.

* * *

Radio promises to play an important part in the political campaign in New York State this fall. Both Republican State Chairman Glynn and Democratic State Chairman Pells have been besieged by agents for radio companies who would contract to carry the voices of the candidates to every radio-equipped home in the State.

* * *

The radio craze has hit Rio Janiero hard! A powerful broadcasting station has been erected on the summit of Mount Corcovado, overlooking the city. The Government buildings and many commercial and private houses are being fitted with receiving sets.

* * *

The electric-light socket aerial has appeared in France and is becoming popular. A French engineer has just turned out one of these devices which, reports state, requires no indicator, lamps, accumulator, or batteries. The French Government has given a large order for these instruments to be distributed among farmers.

* * *

These nights on crowded Broadway, New York, are enlivened by a young man in a large red touring car equipped with loop aerial, receiving set, and loud-speaker. He dashes to and fro along the Great White Way, and—well, you ought to hear the music! The writer of this page can truthfully say that he heard a concert coming through this set, the other night, and that for clearness and tone the reception was truly marvelous.

* * *

The British annual colonial report for Gambia notes the completion of wireless telegraph and telephone stations in that colony at Bathurst and at McCarthy Island, distant 176 miles. These stations are intended for internal communication, as the colony has no organized telegraphic system.

* * *

German manufacturers of radio apparatus are not in a position to make extensive deliveries of their product, according to Vice-Consul Nathaniel B. Davis, Berlin, in a report to the Department of Commerce. This is due to the fact that up to the present time the demand has not been sufficiently great to warrant the manufacture of radio instruments in large quantities.

* * *

The Detroit Radio Association, comprising delegates representing various amateur radio associations in Detroit and its environs, has been organized with the purpose of harmonizing programs and broadcasting hours to minimize as much as possible the wave interference. The membership of about 150 includes representatives of the West Side Radio Association, the Highland Park Radio Association, the City of the Straits Radio Association, and similar bodies. Theodore Schmalzriedt, 9110 West Fort street, is secretary.

* * *

Broadcasting is being used, indirectly, to help more than 13,000,000 foreign-born residents of the United States to improve their health. This service is rendered through the co-

operation of the United States Public Health Service and the Foreign Language Information Service, 119 West Forty-first Street, New York. The Service broadcasts its health talks three times each week, but the benefits of these lectures can only be enjoyed by persons who understand the English language. Wishing to broaden the scope of their usefulness and instruct the many millions in America who can be reached most effectively through their native European tongues, the Public Health Service arranged to give copies of these radiograms to the Foreign Language Information Service for their dissemination to the foreign language press of America.

* * *

In recognition of his completion of his year's radio work in Berlin, leading German radio engineers gave a dinner, on August 26, in honor of Dr. Lee de Forest. On this occasion, Dr. de Forest gave a demonstration of his new motion-picture talking film—the "phonofilm." A feature was a song-record by Mary Mayo de Forest, wife of the inventor, whose soprano voice, Dr. de Forest says, has been of great aid in the perfecting of his invention.

* * *

Taking advantage of the great popularity of radio, the natural research branch of the Department of the Interior of Canada is educating the Canadian people to the extent and value of their natural resources by broadcasting this information through the courtesy of the radio branch of the naval service.

* * *

Joseph Reitz, Jr., a thirteen-year-old boy of Dubois, Pennsylvania, has been confined to his bed by an attack of heart trouble for many months. He has long been interested in radio and, in spite of his handicap of health, has finished a complete radio set all by himself. Last week, according to his report, the dream of his life came true when lying prone in his bed he whiled away the wakeful hours with the receivers of his home-made set to his ears as he listened in and heard music and other broadcast matter perfectly.

* * *

A horse has responded to radio! Charles E. Dean, of Dean Farms, near Chicago, is out with the astonishing announcement that his 2:08 pacer, "Radio," has been trained to follow dictation of the invisible waves and, driverless, races around the track, obedient to the magic flash from a wireless apparatus some distance from the track.

* * *

According to population, Cincinnati is the greatest radio center in the Middle West. This is the boast of radio manufacturers and dealers of that city. They claim that the expected slump in summer business failed to materialize; that retail stores were quite as busy as during the spring months.

* * *

WBAY, Walker Street station of the American Telephone and Telegraph Company, will send out miscellaneous musical programs every day from 11 to 12 a. m. and from 4.30 to 5.30 p. m.

* * *

The first radio news service is now operating. WBAY is sending out its "Radio Digest" every week day between 4:30 and 5:30 p. m. Under the editorship of George F. Thompson, formerly of the "Daily News," a complete digest of the day's events is broadcast.

The Radio Amateur

DOWN in the lower wave-lengths, considerably under the 360-meter waves used by the regular broadcasting stations, can be heard almost anywhere and at any time, a continual succession of code messages and, often, snatches of radio-telephone conversation, says William H. Easton in "Judge." These are the radio "amateurs" talking with each other.

The amateurs form a most remarkable free-masonry, with a secret language, an elaborate ritual, and a fund of knowledge

beyond the reach of ordinary mortals. There are about 20,000 of them at present—rich and poor, young and old, expert and tyro. They live in a world of their own, a world peopled with friendly voices.

The initiation into this order is no easy matter. The government has, very properly refused to permit the indiscriminate use of the ether, so before one can send out either telegraph or telephone messages by radio, he must have a license. To obtain a license the applicant must appear before the United States Radio Inspector of his district and pass an examination covering the

radio communication laws of the United States and the construction and operation of radio apparatus.

In addition to this, he must prove his ability to receive code messages at the rate of at least ten words a minute. If it is impractical for him to go to the inspector's office, he can secure a "second-grade" license by mail, with the understanding that he will come in for examinations within two years. Radio inspectors are located at Boston, New York, Baltimore, Norfolk, New Orleans, San Francisco, Seattle, Detroit, and Chicago.

Radio and the Woman By Crystal D. Tector

I THINK that I am the first one—at least I'll claim the credit until some one tells me otherwise—to predict that the next yuletide season is going to be known as the "Radio Christmas." Already we see signs of it—and I have noticed that quite a few newspapers have echoed the sentiments I printed on this page several weeks ago.

One of the biggest New York City papers says that there is no doubt about it—that everybody will be giving radio first thoughts when it comes to giving presents. Another New York daily predicts that over \$30,000,000 worth of radio goods will be sold during the holiday season. Still another is inclined to the belief that the people, looking for something new to give their friends and relations, will find in radio sets and parts the most acceptable presents.

I see that a new radio cloth is announced. It is short with "radio waves." I saw a dress made up of it, and I must admit that it was about as stylish and smart looking as anything I have observed in new material in some time.

I have also made a note of what will be very popular around the holiday season, and that is a recipe for radio pie. It is made similar to the ordinary, deep-dish apple pie, only apples of the hard, green sort and quinces are used in equal parts. Before the crust is put on for baking, the fruit is given a goodly sprinkle of cinnamon and sugar. It should be served with coffee.

This recipe was given me by an old-time friend whose husband has been a radio bug for ten years back—one of the original "night owls," in fact. He found more pleasure, she tells me, sitting up until far into the night waiting for calls to

come in than in any other pastime. Of course, as he was always at home she had no objection, but along toward midnight he would get hungry and ask for pie and coffee—a real yankee supper. Apple pie was his favorite; but, one day, the good wife discovered that she was short of apples and, in desperation, she used an equal amount of quinces. Now, her Friend Husband went wild with delight and said that it was the best pie he had ever eaten. And like the minister who exclaimed when he tasted whiskey and milk for the first time, "Great heavens! what a cow," this very pleased radioist cried out, "Where DID you get those apples?"

Well, I am pleased that I have predicted a radio Christmas. It is no little glory and you must not blame if I am a bit peppy over it. Let us see to what extent my prediction will come true.

The latest radio story comes from Newport. I am told that one fair miss whose dad counts his wealth in the six-figure "colyum," decided that the home would not be complete without a receiving set. She phoned dad in New York, and, being an obliging father, he ordered one sent up. When it arrived, the British butler asked the expressman what it might be?

"A radio set," was the reply.
"Then hit must be for the cook," said the haughty servitor.
"My lady 'as a pearl set, and a diamond set; but any jewelry coming in a package as large as that must 'ave been sent to one of the underlings."

"Them ain't jools—you poor fish!" yelled the expressman, staggering under his load, "It's a radio set—something you hear beautiful music with!"

And just then the fair daughter appeared on the scene and explained.

Radio—and This Summer of 1922

(An editorial inspired by, and describing the photographic illustrations on, the front cover of this issue of RADIO WORLD.)

RADIO has brought new romance into the world to supplement the exploits of Paul Revere and John Paul Jones. Radio travels as swiftly as light—not through one valley, or on one lonely sea, but to the world at large on the tireless wings of ether.

Radio answers the call for more liberal education of nations and peoples, and permeates the remote places of the earth with music and information.

Turn to the front cover of RADIO WORLD, this week. Here we see how radio played an important part during the summer of 1922—now drawing to its close.

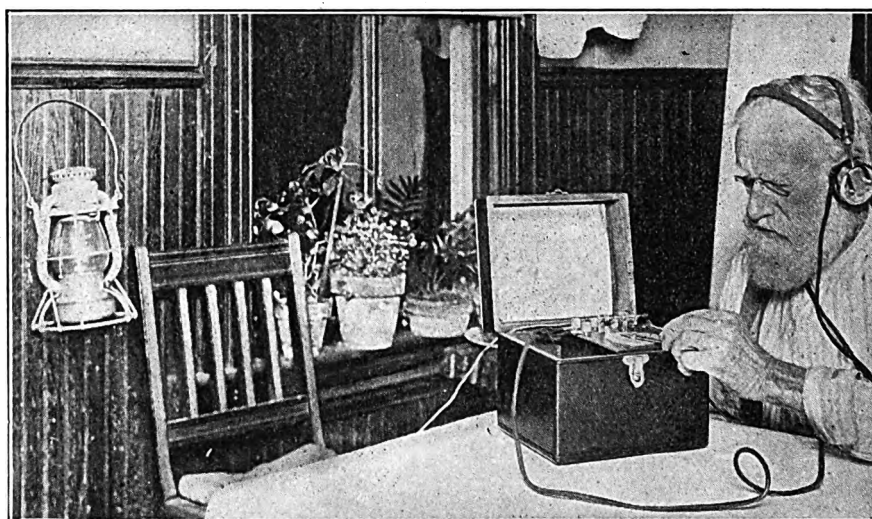
The photograph to the left of the upper picture shows a mother and her daughter tuning in a broadcasting station, perchance to hear a concert. Their means for receiving the ether is a loop aerial mounted on the radiator of their car. This reduced the interference to a minimum. By a simple operation of the direction of the loop aerial, this may be wonderfully controlled. The set is one of the portable type, which may be safely carried on any trip—anywhere. It comprises a vacuum-tube detector with two stages of amplification.

The picture on the right shows the same set with loop and other apparatus on the ground.

The lower photograph will prove what one may do with radio when touring in a motorcar. This particular party is passing through Chicago and listening to music from Newark, New Jersey.

To print all the wonderful stories of the part radio played in summer vaca-

The Up-to-date Farmer Finds Radio Is His Best Friend



(C. Kadel & Herbert News Service)

This up-to-date farmer has just connected up his radio receiver, to get in on the weather and crop reports. This is of vital importance to him. Heretofore he had to rely on a week-old newspaper, perhaps. Today he gets his information on the dot.

tions this year, would fill pages of RADIO WORLD. To reduce them to a word; "No vacation in the future will be complete without radio."

Change in WGY Program

BEGINNING Monday, September 11, WGY, the radio broadcasting station of the General Electric Company at Schenectady, New York, will offer regular musical

programs every Monday evening in addition to the programs of Tuesday, Thursday, and Friday nights as at present scheduled. Other important additions will be made to the schedule and will be announced later.

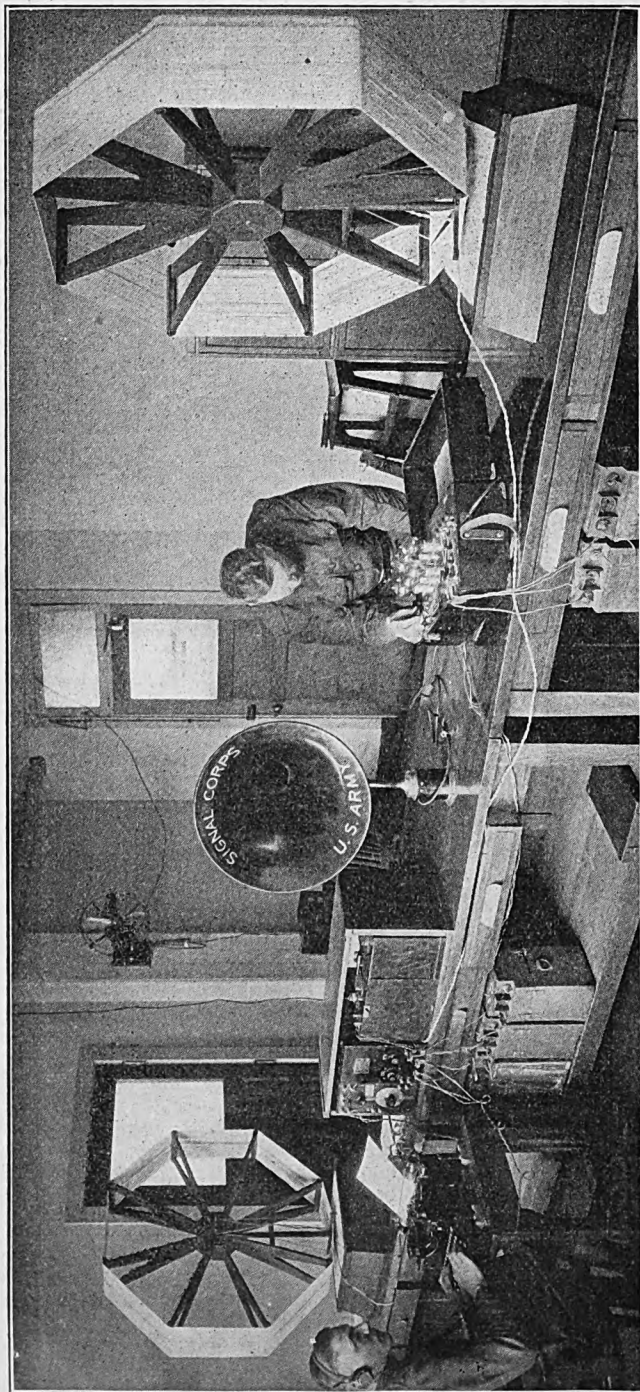
Latest broadcasting map 15c. That is, a complete broadcasting map appeared in Radio World, No. 8, dated May 20. Mailed on receipt of 15c. Radio World Company, 1493 Broadway, N. Y. C. (Advt.)

U. S. Signal Corps' Big Receiving Set

IN Washington, D. C., one of the most active radio-centers in the world, the Signal Corps of the United States Army, at its headquarters, operates one of the largest receiving sets ever installed. The photograph at the left gives a splendid view of the large room, the indoor loop-antennae, the receivers, and the massive loud-speaker. With this receiving set, messages from European stations are picked up and recorded by the typist at the left. Perhaps no other branch of the service has taken so active an interest in radio as the Signal Corps, and it is certain that no other branch boasts such up-to-date equipment. Every new device is tested out, and no improvement is overlooked.

The Army Air Service plans to use the new Signal Corps set No. 135, combining radiophone and telegraph circuits good for distances up to 75 miles and 200 miles, respectively. The range will be greater than is planned for the big Martin bombers, however, as better facilities for erecting aerials are available on airships than on planes. One method considered is to install the antenna within the envelope; another is to suspend it below the ship, drawing it up upon landing; while a third contemplates hanging the wires of the aerial along the sides and over the top of the ship.

(C. Harris & Ewing, Washington, D. C. From Paul Thompson, N. Y.)



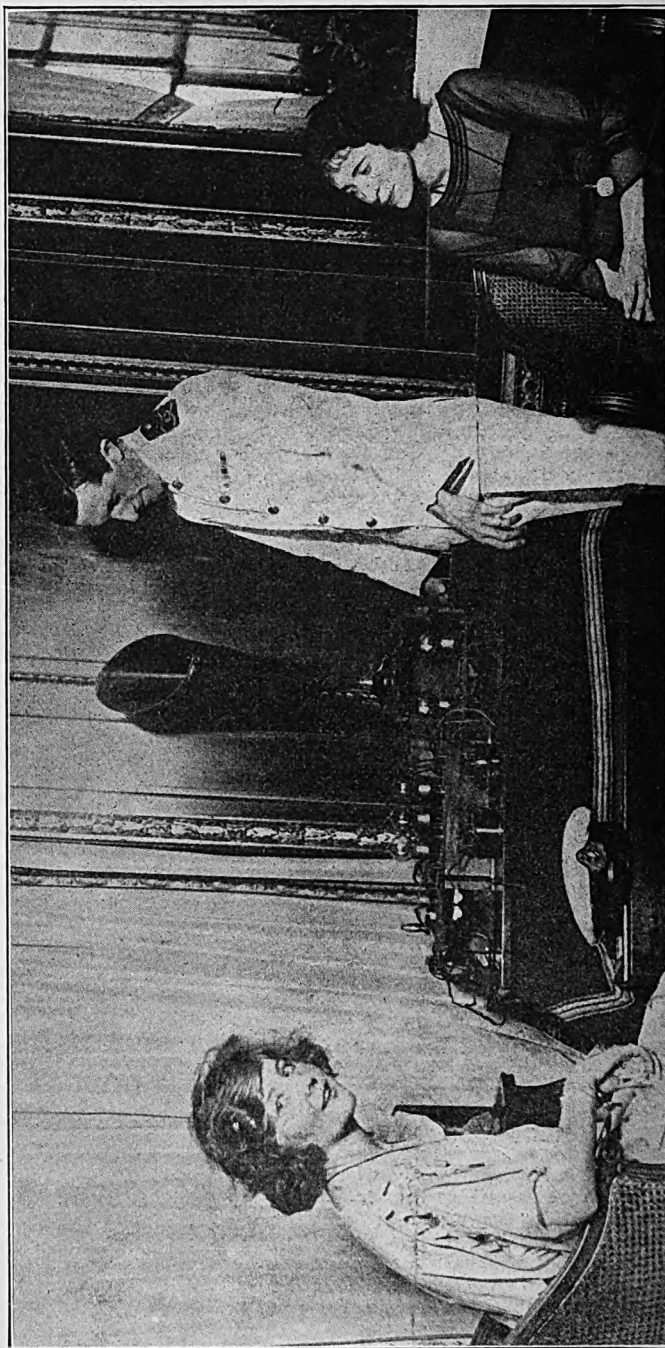
"Listening In" Aboard the "Mauretania"

THE Cunard Line has installed a radiophone in the main salon of its gigantic Atlantic liner, "Mauretania," for the entertainment of passengers. Every afternoon and evening, a radio officer is in charge and concerts broadcast from several of the larger American stations have been clearly heard.

The ladies in the photograph at the right, sitting on either side of the receiving set, are Miss Florence Dixon (left), the dancer, and Miss Irene Loo. Both are enthusiastic radio fans, Miss Dixon being able to read code. She did much on the voyage over to bring other women passengers to a clearer understanding of radio.

There is little doubt that radio is taking first place as a means of recreation. If you can picture yourself aboard a floating palace—a great ocean steamer furnished and equipped to the last degree—and seated in her luxuriously furnished salon listening to a concert coming clear and distinct from shore, you have an idea of the very advanced pleasure of ocean travel in these days. But this is only one thing that radio will bring to those who cross the seas. It will not be long before every modern steamer is so thoroughly equipped with radiotelephonic devices that to talk with those you have left behind or those you intend to meet will soon be as common as ringing up someone in your home town.

(C. Central New Photo Service.)



"Waiting for a Bite" Is No Longer TireSome

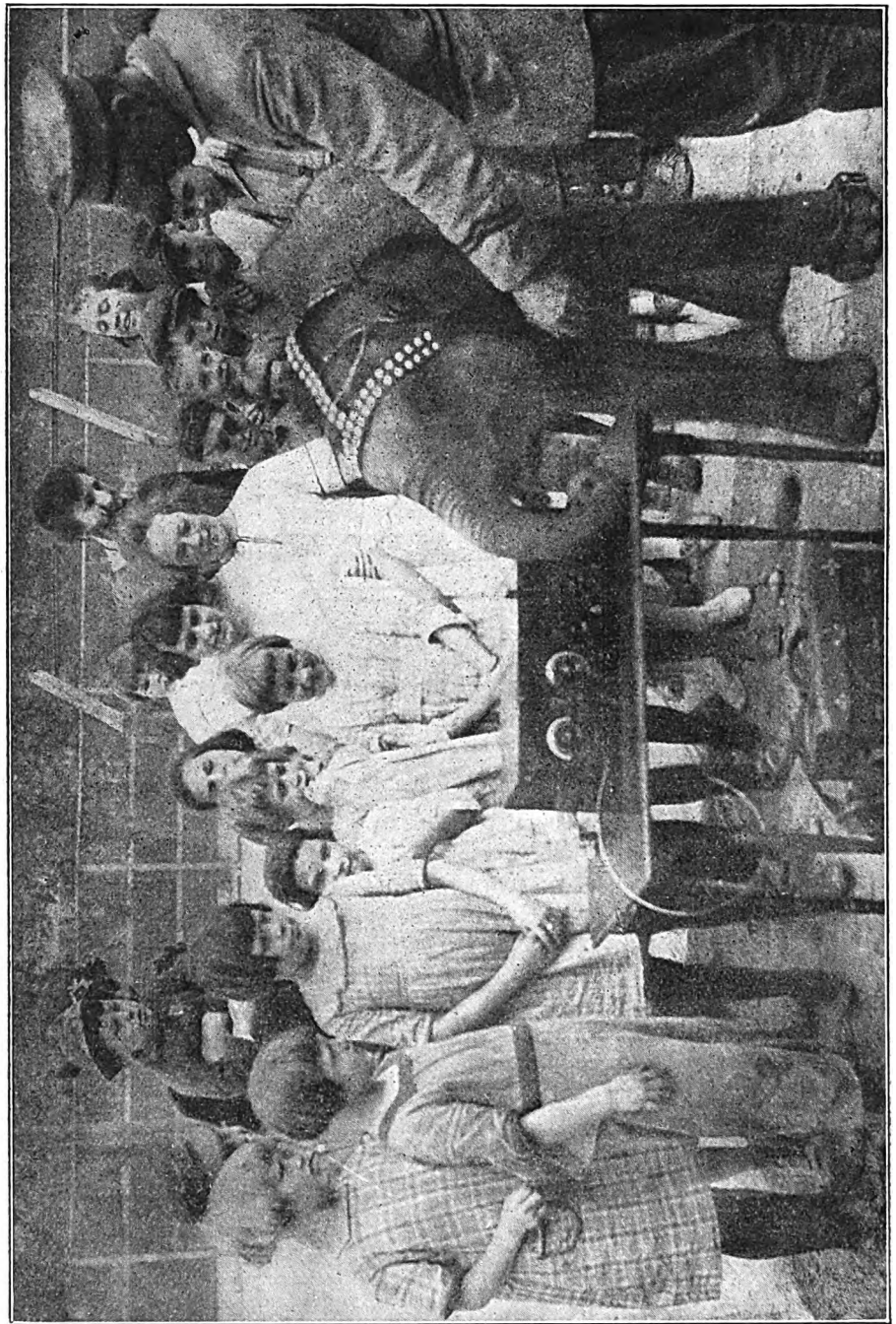
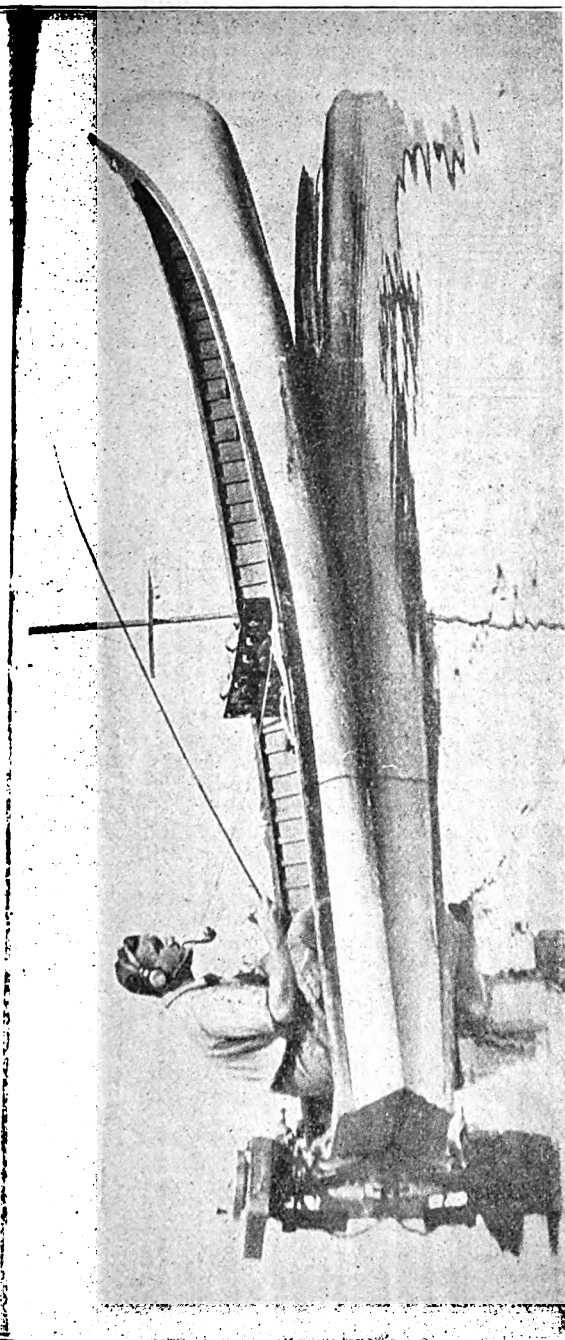
Waiting for a Bite Is the fisherman's favorite pastime. The ingenious disciple of Isaac Walton, in the photograph at the left, is Mr. William Nigey, of New York, on Bolgrade Lake, Maine, a particularly favored spot of fishermen. It is not necessary for him to row, as a study of the photograph at the left will show that his boat-canoë is motor equipped, and that, when he is in a place where the funny tribe bite, all he need do is "shut off, attach his antenna, and use his motor as a ground."

What could be more perfect?

Radio found tremendous favor with the vacationists of 1922—and here is positive evidence of it. When a practical man, fond of the great sport of fishing, hies himself to some faraway spot and rigs out his craft with a radio set—well, it does prove that he may expect some wonderful "stunts" when the fans begin to think 'em out.

Many a mountain camp was enlivened this summer by radio; and many a seaside resort found that the new mode of transmitting words and music added much to the gaiety of its guests. All through the Adirondack Mountain region radio sets were unusually popular. It is evident that when the vacation season of 1923 rolls around, radio will be one of the most popular elements of pleasure.

(C. Kadel and Herbert News Service.)



Baby Elephant Hears Mother's Voice

"TOM THUMB" is a baby elephant, four months old. He weighs 276 pounds. Tom belongs to a traveling circus which "played" Seattle, Wash., several weeks ago. Now, Seattle, like every other up-to-date American city, has its full quota of radio experimenters, one of whom was anxious to discover if a baby elephant would recognize its mother's voice by radio. This may seem silly, but the average radio experimenter stops at nothing to-day in his effort to learn what radio will do—and surprising are the things brought to light.

A transmitting set was installed in the circus tent and Tom Thumb was taken to a point in the suburbs of the city where the receiving set was rigged up and the head phones attached to his ears. Naturally, Tom's mother bellowed loud enough to be heard miles away when she missed her baby boy; perhaps there are amateurs who picked up her bellowing and mistook it for static—who knows? It is said that Tom became quite nervous and fidgeted about—and it is evident that he heard something. However, he seemed to be interested in the set and insisted on using his trunk to tune the incoming sound to his apparent liking. At any rate, he amused the children of the neighborhood who gathered around him, as the photograph at the right shows.

Broadcasting experts claim that birds and animals will provide an interesting part of radio programs of the future. Already plans have been made to broadcast the whistling of the marmots in Glacier National Park—little doglike animals that produce a music that is particularly sweet and unusual. Canaries have been singing into transmitting sets in California; and in England, recently, it is reported, the plaintive notes of a nightingale were distinctly heard. All of this means that radio will become educational as well as entertaining. It is impossible to state—to imagine—how far it will go in bringing to mankind many of the mysteries and wonders of nature which have been denied him. The radio inventor and experimenter are working fast.

(C. International News Reel.)

Answers to Readers

I HAVE a short-wave regenerative receiver with a two-stage amplifier. I also have two variable condensers, 21-plate and 43-plate. What should I do with them?—R. Creter, Madison, Conn.

Placing a variable condenser in the ground circuit has the function of reducing wave length—that is, if placed in series. If you have a short-wave receiver and you can get the short-wave stations, the variable condenser is not needed. If your aerial, with your receiver, does not permit you to get down to the lower wave-lengths then insert the 43-plate in series with ground. The 21-plate may be placed in shunt to the secondary.

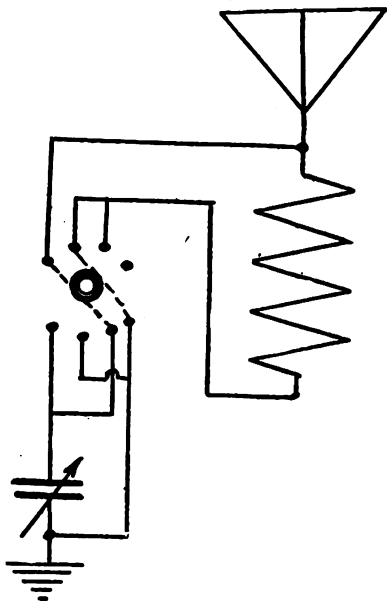
* * *

Will RADIO WORLD publish a hook-up of a set using honeycomb coils for the primary, secondary, and tickler; also detector and two stages of amplification? I use a loud-speaker with this set? What size coils should be used for concerts on the 360-meter wave length?—F. F. Smith, Broad Channel, L. I.

Your question is fully answered in this issue in the article headed, "How to Make a Honeycomb Coil with a Two-Stage Amplifier," by Fred Chas. Ehlert. A loud speaker may be used easily with this set. Referring the coils, or inductances, would suggest you to use L 35 for tickler, and L 50 or L 75 for both primary and secondary. In conjunction with these coils a .001 microfarad capacity variable condenser should be used.

* * *

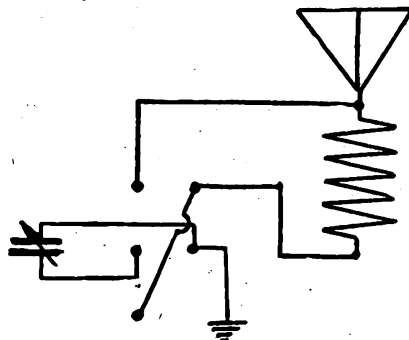
Please publish a schematic diagram showing how to connect a capacity switch, double blade. This would either have to connect the condenser in series to decrease the effective wave-length of the aerial, or connect in parallel the condenser across the primary of the coupler.—Charles Spelling, Lancaster, Pa.



Hook-up, showing how to connect a capacity switch, double blade, as requested by Mr. Charles Spelling.

The accompanying hook-up shows the standard capacity-switch. Dotted lines show position of blades when condenser is placed around, or in parallel, with primary of vario-coupler.

It would interest me to see a diagram of a circuit employing a double-throw, double-blade switch (knife type) showing how to connect a condenser in series, or parallel, to tuner.—Joseph Schenck, New Brunswick, N. J.



Hook-up of a circuit employing a double-throw, double-blade switch, as requested by Mr. Joseph Schenck.

A good circuit is published above showing how to connect switch with tuner, as you describe.

* * *

What is counterpoise ground and where can it be used?—Morris Schneider, Glen Cove, L. I.

Counterpoise ground is artificial ground, such as large pieces of sheet metal, or a number of wires, spread out and insulated from the ground.

The counterpoise is placed just beneath the aerial. In large commercial stations, this counterpoise or ground is used in preference to the earth ground. It is claimed that the receiving qualities are considerably increased.

Always have the counterpoise longer and larger than the amount of copper the aerial contains in order to give effective capacity. The idea is to have the aerial and counterpoise act as a capacity in the circuit.

* * *

How many turns will be required to wind on spider-web coils, for primary, secondary, tickler, and 360-meter wave length? My antenna is, approximately, 100 feet long. I am using a primary and secondary condenser.—RADIO WORLD Reader.

Thirty-five turns may be used for the tickler, 50 turns for primary, and 75 turns for secondary. The tickler coil generally has to be about 50 per cent of the secondary, but good results have been obtained on the above number of turns.

* * *

Is the enclosed circuit correct? Have worked around it but with no results.—Patient Reader.

Your circuit is incorrect. Reverse your battery placing the plus, or positive, pole on the plate side of the tube and the negative side on the telephone block. If your connections are all properly soldered and making good contact you should get good results.

* * *

Is it possible for me to use a regular alternating-current lighting circuit as an aerial to receive music?—Thomas Bischoff, New London, Conn.

Considerable depends on the electric-light circuit. If the lines come into your house, overhead, you are apt to get much better results than if they came into the house through a conduit pipe. It is very difficult to predict results with this system, as most

everything regarding broadcasting depends on local conditions; for instance, the amount of steel in the building and the electric-light circuit itself. The condenser, in this particular case, must be built to stand a pressure of, at least, about 2,000 volts without breakdown. I would suggest that you will find it cheaper to buy a condenser of that character from some reliable concern than to make it, thereby creating less danger in using it. Remember that a good reliable concern always guarantees its products.

* * *

I am using a lamp-socket plug as explained in RADIO WORLD, No. 18, dated July 29. Must a ground connection be used with this type antenna?—Louis Hansen, Toledo, Ohio.

A regular ground-connection will have to be made with this type plug. The two posts are on the plug so that various combinations of capacity may be obtained and the correct value used.

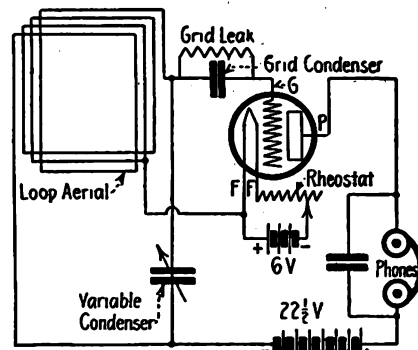
* * *

In your RADIO WORLD, No. 19, dated August 5, you publish a hook-up by George W. May. I would like to use this circuit in making a set. Are the variable condensers shown all the circuit requires, or is a vario-coupler used?—F. C. Burnell, Long Island City, N. Y.

In this circuit, no vario-coupler is used. The loop and transformers are of such inductance and capacity that they respond to the 360-meter wave length. The variable condenser used across the loop is a 43 plate of .001 microfarad capacity.

* * *

Will you publish a hook-up of a vacuum-tube set with loop aerial.—John Hayes, Los Gatos, California.



Hook-up of a vacuum-tube set with loop aerial, as requested by Mr. John Hayes.

The schematic diagram above shows the loop aerial connected to a vacuum-tube set. It must be understood that, at least, two stages of audio frequency must be used with this set in order that some fair distance may be covered.

* * *

With my single-slide crystal set, I hear WWZ and WHN. Why can't I hear WJZ, Newark, N. J.?—Leo Hart, Brooklyn, N. Y.

You are very close to the broadcasting stations you mention and that probably accounts for your hearing them. Your detector crystal is not sufficiently sensitive to hear WJZ, and we advise you to get a more sensitive crystal or install a tube detector.

* * *

Can I use a 2,000-ohm with a 3,000-ohm receiver? What is the connection?—John Merschaff, Toledo, Ohio.

You may use these phones together, but it is always best to use those same ohmage together. Connect them in series with each other.

Fifty-two issues for \$6.00. Sub. Department, Radio World, 1493 Broadway, N. Y. C.—Advt.

Steinmetz Defines Possible Radio-Power Transmission Waves Sent Around Earth from Powerful Station Would Return to that Station and Create Greater Force

(Abstract of an address made by Dr. Charles P. Steinmetz, chief consulting engineer, General Electric Company, before the Radio Congress, Chicago.)

THE successful development of radio communication by telegraph and telephone, raises the question of the possibility or impossibility of radio power transmission.

In some respects, radio-power transmission exists to-day, for the message you receive by radio has been carried by the power of the electromagnetic wave from the sending to the receiving station. However, while the sending station sends out electro-magnetic waves of a power of several kilowatts, or even hundreds of kilowatts, this power scatters in all directions, and it may be only a fraction of a milliwatt which we receive, that is, less than a millionth of the power sent out. But this small power is sufficient, when amplified, to give us the message.

The problem of power transmission essentially differs from that of the transmission for communication, that in power transmission most, or at least a large part of the power sent out by the generating station must arrive at the receiving station, to make it economical to transmit the power.

Hence, the problem of radio-power transmission is that of directing the radio waves so closely that a large part of their power remains together so as to be picked up by the receiving station. Much successful work has been done in directing radio waves. For instance, our transatlantic stations send out most of their power eastwards. But still, even as directed, the power scatters over the coasts of Europe from Norway to Spain, so that it is impossible to pick up an appreciable part of it. The limits of impossibility of concentrating a beam of radio waves may be illustrated by comparison with a beam of light. Light is an electromagnetic wave, differing from the radio wave merely by having a wave length many million times shorter. While usually the light scatters in all directions, like the wireless wave, we can direct it in a concentrated beam by the searchlight. But there is inevitably a scattering of the light in the searchlight beam, and when the beam starts—perhaps with a square-yard section at the search-light mirror, at ten miles distance—it has, at the very best, scattered to a diameter of two thousand feet, and at one hundred miles distance the beams cover a section of sixteen square miles.

If it were a beam of radio power, it would thus require, at one hundred miles distance, a receiving station covering sixteen square miles, about four miles wide and, what is still more difficult, four miles high, to pick up a large part of the power. The cause of this scattering is two-fold: First, the inevitable imperfections of any apparatus. No matter how perfect a reflector, there are slight imperfections, and at a hundred miles distance, they seriously count. Furthermore, even with an absolutely perfect reflector, the beam of light would stay together only if the light came from a mathematical point. As it must, however, come from a small area, this causes an inevitable scattering, which at best gives an angle of scattering of about two degrees. This is about one hundred

times as much as would be permissible to economically transmit power a hundred miles by a direct radio-beam.

Thus the probability of power transmission by directed radio is very small, except, perhaps, in very special cases where the distances are moderate and the efficiency of transmission of secondary importance.

The second possibility of radio-power transmission—at least theoretically—is by resonant vibrations or standing waves. Suppose we had a very large sending station sending out electromagnetic waves not of hundreds, but of thousands of millions of kilowatts. Suppose we could find a wave length where the absorption in the passage of the wave through space is sufficiently small so as to be negligible compared with the amount of power. Assuming, first, there were no receiving stations, then the waves issuing from the sending station would circle the globe and return to the sending station, and if the wave length is adjusted so that the return wave coincides with the outgoing wave, it would return its power, and little power would be required from the sending station to maintain such a system of high-power standing waves, only enough to supply the losses—just as little power is required in an electric wire transmission system to maintain the voltage wave so long as no current is taken off.

Suppose, now, we erect a second station, tuned for the same wave length as the sending station. It would resonate with the standing electromagnetic wave issuing from the sending station, thereby stop its passage by absorbing its energy. It would, as we may say, punch a hole in the standing wave-sheet coming from the sending station. Power would then flow into this hole; the sending station would begin to send out additional power to maintain the wave sheet, and this power would be received by the receiving station. This would give real radio-power transmission. Any receiving station of suitable design would then be able to pick up power from the universal power supply carried by the standing wave-sheet covering the earth.

Several sending stations may send out power. These may either have different wave lengths that would not interfere, and the receiving station could be tuned to receive power from any of the generating stations. Or—what would be preferable—all the generating stations would be tuned to the same wave length; that is, the same frequency. Then they would have to be synchronized and operate in synchronism, just as different electric-generating stations on the same transmission line are operated in synchronism.

Theoretically, this is an interesting speculation, but whether it could ever become a possibility, would depend on the question, whether a radio wave of such length could be found to make the losses of power by absorption, *et cetera*, economically permissible, and whether stations for such wave length and power would be economically feasible. Furthermore, it would have to be an international development. Therefore, even if such radio transmission by a stationary electromagnetic wave sheet were possible, its realization at best is rather distant.

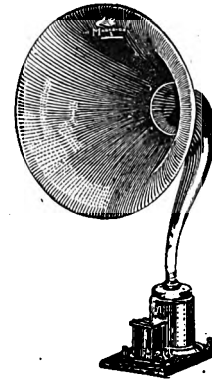
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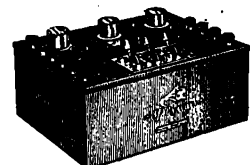
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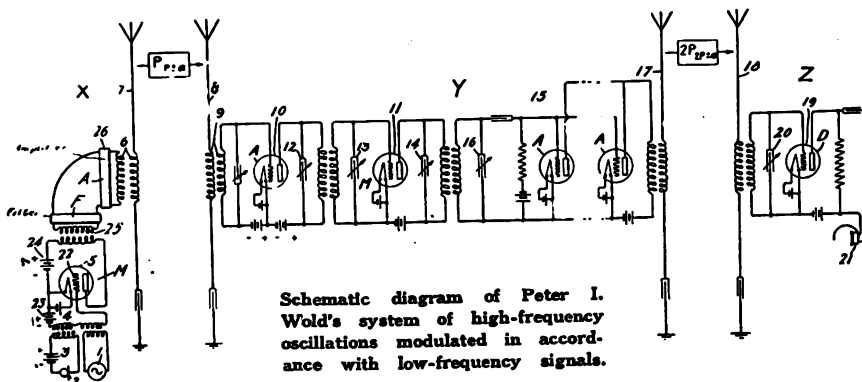
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Radio Patents



To Eliminate "Singing" in Relay Systems

No. 1,424,866. Patented August 8, 1922.
Patentee: Peter I. Wold,
East Orange, N. J.

THIS invention relates to systems for relaying or repeating such signals or other low frequency impulses as are carried by high-frequency oscillations of the type used in radio transmission.

In particular it embodies a system in which high-frequency oscillations, modulated in accordance with low-frequency signals, are received at an intermediate or relay station and are so changed in character that there is no tendency to produce "singing." This object is attained by receiving, at the relay,

or repeating station, the modulated high-frequency oscillations and impressing them on a suitable device, such as a thermionic vacuum-tube modulator. The output circuit of such a modulator will contain a certain number of oscillations of high and of low frequency, one at least of which consists of a carrier wave of double the original carrier frequency and modulated in accordance with the original signal.

This component of the output may be selected out by suitable circuits and, after amplification, may be transmitted to a remote station. This modulated doubled frequency will have little or no effect on the receiving antenna at the repeating station, for the receiving system is tuned to the original carrier frequency. Thus the tendency to "sing," which is so common in all relay systems, is eliminated.

telegraph key or other primary source of modulated power shall handle all the power required to be modulated; to modulate the radiated power in an efficient manner by correct proportioning of the system.

These objects are accomplished by making use of the fact that in a thermionic amplifier of the audion type, the impedance of the output circuit depends upon and varies with the voltage impressed upon the input circuit, and that the changes in power output, due to such changes in impedance, are much larger than the power input required to produce them. On account of this property, it is obvious that if the antenna current is made to flow through the output circuit of an amplifier, large variations in the power radiated from the antenna may be produced without using excessive power in the primary modulating source, and, therefore, permitting the use of a commercial telephone transmitter or telegraph key as this primary source.

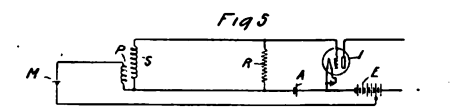
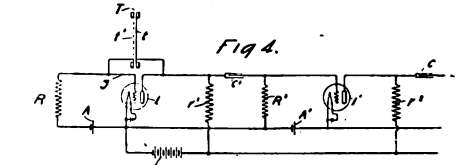
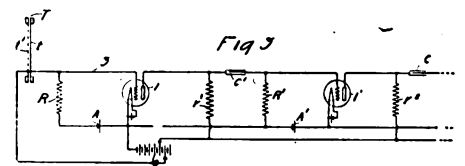
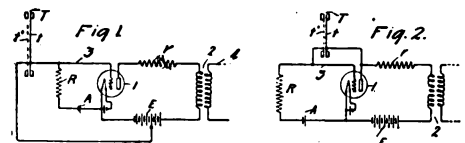
It has been found, however, that the impedance of the output circuit of the vacuum-tube amplifier, as at present constructed, is so high that it cannot be inserted directly into the antenna without seriously decreasing the current in the antenna, consequently the radiating power of the transmitting system. In order that modulation shall be most efficiently carried out, it is necessary that the impedance of the modulating device shall be comparable with the other impedances in circuit with it, and to accomplish this correct proportioning of impedances, this invention proposes to insert the vacuum tube as a shunt upon some impedance in the antenna which is comparable with that of the tube.

Connecting Transmitter with Amplifiers

No. 1,422,837. Patented July 18, 1922.
Patentee: Irving B. Crandall,
Nahant, Mass.

THIS invention in its generic aspect anticipates the use of either a condenser transmitter or a microphone transmitter, but is particularly adapted to the former case.

Special objects of the invention are to simplify the circuits and reduce the amount



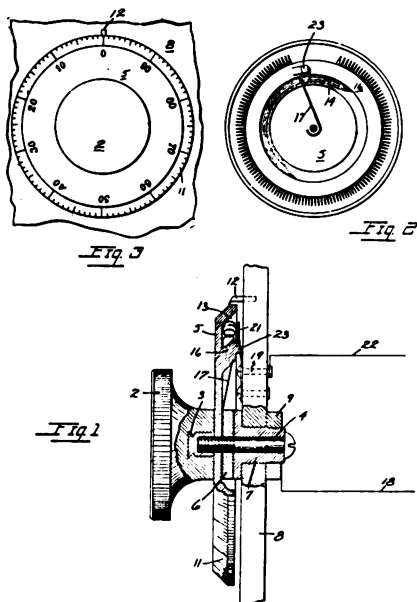
Schematic diagram of Mr. Crandall's invention condenser transmitter with amplifiers.

of battery required for the operation of such a combination of transmitter and amplifier. When a condenser transmitter is used this is accomplished by using a single battery or source of electrical energy for the two purposes of charging the transmitting condenser and operating the associated vacuum tube, and when a microphone transmitter is used the battery energizes the microphone and operates the vacuum tube.

A Promising Rheostat

No. 1,424,515. Patented August 1, 1922.
Patentee: John Parkin, Jr.,
San Rafael, California

MR. PARKIN claims that his rheostat will vary the resistance in an electric current. It is of few parts, of simple construction, and has a graduated dial to permit close adjustment of the resistance. In short, it is a variable resistance device of the dial type, practically all of which lies in front of the panel on which it is mounted, leaving the rear of the panel free. Another object is a dial-type rheostat which is very easy to install.

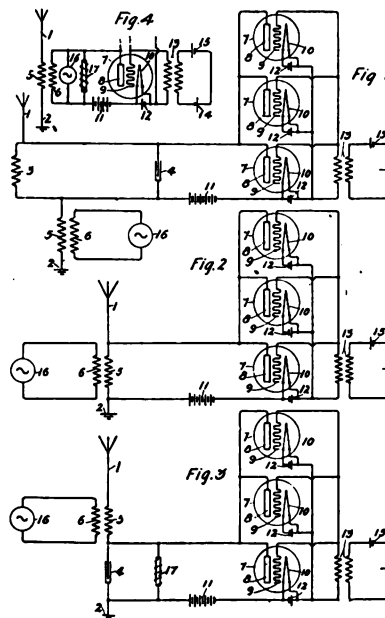


This rheostat comprises a knob (2) of bakelite or other nonconducting material molded about the core or center (3), preferably of brass, and threaded to receive a screw which acts as the shaft upon which the device is mounted. The periphery of the knob is knurled to permit digital control.

Transmitting Signals by High-Frequency Waves

No. 1,422,882. Patented July 18, 1922.
Patentee: Harold W. Nicholas,
Maplewood, N. J.

THIS invention is to improve the transmitting of signals by means of high-frequency electrical waves. Its object is to vary, or modulate, the amplitude of radiated high-frequency waves in accordance with the wave form of signals to be transmitted; to accomplish this modulation without requiring that the telephone transmitter,



Although Mr. Nicholas's is described particularly as applying to a wireless transmitting system, it will be understood that the antenna may be replaced by a portion of a wire circuit, for example, a telephone line, without departing from the broad idea underlying his basic principles.

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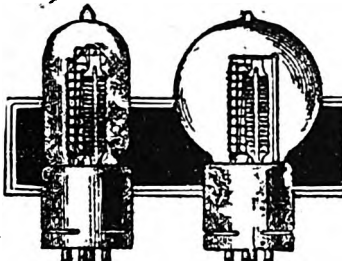
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Scope of Government Radio Control

THE Government Radio Service of the Department of Commerce which has licensed 3,859 commercial and 15,504 amateur radio stations, was first organized on July 1, 1911, by the Department of Commerce and Labor. Its original purpose was to aid in enforcing the Wireless Ship Act of June 24, 1910, which specified that vessels carrying fifty or more people and plying between ports 200 miles or more apart, were required to be equipped with radio apparatus operated by a man skilled in its use. In July, 1912, the first act was amended to require an additional source of power for radio, besides the power plant of the ship, as well as a means of communication between the radio room and the bridge, and two or more persons skilled in radio communication, one to be on duty at all times when the vessel was under way.

Today the enforcement of the ship radio-laws is under the immediate supervision of the Bureau of Navigation of the Department of Commerce and is accomplished through radio inspectors assigned to the principal seaports on the Atlantic, Pacific, Gulf, and Great Lakes coasts. These inspectors are required, so far as possible, to inspect the radio equipment before each sailing of a vessel subject to the law, to determine whether or not the apparatus is efficient and afford proper protection to the passengers and crew.

Commercial and other land stations came in for their supervision in 1912, when an act to regulate radio communication was approved on August 13. This work is also handled by the Bureau of Navigation, and requires the inspection and licensing of all radio transmitting-stations except those belonging to the government. All operators working in such stations are also examined and licensed by the Radio Section of the Bureau.

In addition to the above laws of the United States, it is a duty of the Bureau of Navigation to require compliance with the International Radiotelegraph Convention of 1912.

There are nine radio-inspection districts, embracing the United States, Porto Rico, Hawaii and Alaska. All told the radio transmitting stations in the United States totaled 20,841 on July 1, but as government land and ship stations in the United States are not controlled by the department, only 19,363 stations were licensed.

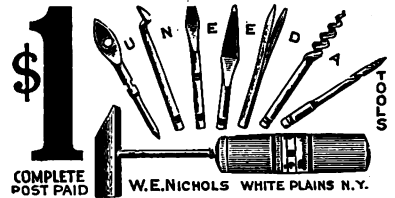
Of the total stations, 15,504 are amateur; 2,773 commercial ships; 1,194 government ships; 575 commercial land; 284 government land, and 511 special stations.

The radio section issues several publications, among them a monthly service bulletin, and annual lists of commercial and government radio stations, and amateur radio stations. The 1922 editions of the station lists are now in press and are expected to be ready for distribution at the government printing office about October 15, at 15 cents each.

How to Make an Electron Tube Detector Unit

A CIRCULAR describing how to make an electron-tube detector unit, which may be used with apparatus previously described by the Bureau of Standards, is now being prepared for issuance. The estimated cost of the complete set is between \$23 and \$37, including the cost of batteries. Eventually the description will be available to the public through the government printing office.

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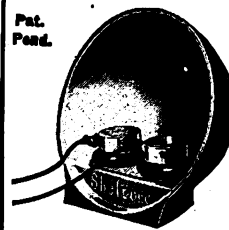
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No tubing or horn to distort delicate notes. Swells every sound into full richness!

SHELTONE CO.
20 Clinton Street
Newark, N. J.

\$500 AT ALL GOOD DEALERS
OR DIRECT BY MAIL

\$498
for this



5-Room House
Freight Paid to Your Railroad Station.

\$968
for this
7-Room House



This handsome, modern, two-story dwelling shipped, freight paid to you for \$968. Contains big living-room, open stairway, dining-room, kitchen, pantry, rear porch, three bed-rooms, bath-room and closets. Full description in the Free Aladdin Catalog.

Million Dollar Corporation Guaranty

Price Includes All High Quality Lumber, millwork, windows, doors, flooring, siding, roofing, interior woodwork, glass, nails, paints, varnishes and hardware. Lumber cut-to-fit. Save waste on material and labor. Complete plans and instructions. We will ship these houses anywhere on quick notice. Send today for Catalog 2136 and complete information.

THE ALADDIN CO.
BAY CITY, MICHIGAN

52 Weeks for \$6.00
Complete Your File of **RADIO WORLD**
Copies of Radio World No. 1

Advertising Rates, Display, \$5.00 per inch, \$150.00 per page

Radio Merchandising

Classified Quick-Action Advertising, 5 cents per word

Telephone Bryant 4796

In Spite of— The Shrewdest Observers of Conditions In This Country Are the Men Who Handle the Big Stock-Brokerage Business In Wall Street

IT is interesting to note that these men have permitted the market to rise during the past week or so. Many stocks, industrial and otherwise, that have not been active for a long time, have suddenly shot ten points ahead. Other standard stocks that have been more or less dormant for a considerable period, also have shown new life during the past week.

And all this, mind you, in face of the coal strike, the railway strike, and other things which are supposed to disturb business conditions in a very material degree. Wall Street occasionally makes a mistake, but not very often, and it is quite evident that the financial powers that be are quite sure we are going to have a great fall and winter—perhaps, not because of the recent conditions, but in spite of them.

Therefore, ye of little faith, harken and follow the leaders and KNOW that we are on the threshold of a remarkable, busy, successful, and lengthy stretch of renewed business activity.

Radio Goods that Stand the Test

Manufacturers, send a sample of your goods to our Technical Editor, Fred. Charles Ehler, 9006 Pleasant Street, Queens, Long Island, N. Y. It will be carefully tested and returned. If your goods satisfy our experts, RADIO WORLD'S endorsement will be published in our merchandise department without charge or obligation of any kind on your part. This is a free service on the part of RADIO WORLD, calling for no expense whatsoever on the part of the manufacturer, except the sending of a sample of his goods.

Knott Sure-Ground Clamp

E. R. Knott Machine Co., 1 Ellery Street, South Boston, Mass.

THE radio enthusiast who wishes a perfect connector may be assured of this by using the Knott Sure Ground Connector. This connector is a cast product especially designed with a screw arrangement. By loosening the screw clamp, one merely fastens it around the water or gas pipe, or any other metal ground and make up fast on the set screw. While making up on the set screw, the metal that grips the ground has a needle point which finds and digs itself into the pure metal of the ground. A hole is also accounted for, so the ground wire when brought to the clamp from the set may be soldered. This is a compact, efficient and rigid clamp.

Antenella Plug

Chas. Freshman Company, 290 Hudson Street, New York City, N. Y.

A NEAT-APPEARING plug for the radio fan who wishes to use it for receiving concerts by inserting it in an electric-lamp socket. The antenella plug is well-designed and of good construction. It is in a form that can be easily handled. Insulating housing material of two longitudinal sections is assembled, each having a condenser and binding post on each section. Voltage breakdown-test proved that the plug withstood, approximately, 1,500 volts before discharging. This should guard the owner against any breakdown on the ordinary electric-light lines. The condensers are of good construction, using mica as their dielectric. Plates are of copper foil and capacities of .0003 mfd., capacity. When employed as an aerial with crystal set, results were good but were found to be far better when employed with a vacuum tube set.

A screw arrangement on the plug makes it possible for anyone to connect it to the ordi-

nary electric-light socket. The unit, when assembled, is rigid, efficient and compact. It is one of the plugs manufactured that may be recommended to anyone who desires to receive concerts utilizing a plug in the lamp socket as an aerial.

Name Plates for Receiving Sets

E. R. Knott Machine Co., 1 Ellery Street, South Boston, Mass.

WHEN making up a receiving set, most amateurs—after they have one assembled—forget just what connections they made, especially on binding posts. For this reason, wrong connections are fatal. The answer to this is that when proper connections are made, a name-plate should be fastened properly to the set. The E. R. Knott Machine Co. manufacture such name-plates as Aerials, Ground and others. Such a binding-post radio name-plate—which goes over the binding post and reads above the fastening—is a real necessity on a radio set. Every amateur should mark his set to prevent burning out instruments because wires are connected incorrectly.

Radio Homcharger De Luxe

BEAUTY has been combined with utility in the new Radio Homcharger de Luxe, a battery-charging rectifier developed by the Automatic Electrical Devices Company, 185 West Third Street, Cincinnati, Ohio, especially for the homcharging of A and B batteries. Finished in a dull mahogany and old gold, it harmonizes with the finest room-furnishings, and permits the radio enthusiast to recharge his battery after an evening's entertainment without disconnecting it from his set.

The Radio Homcharger de Luxe is constructed on the same perfect operating principle used in the type A homcharger. Its working parts are entirely enclosed, eliminating all danger of shock and fire. It is

Revival in Trade

Southern Visitor Brings Good News from His Section—Particularly in Radio.

EDMUND DUPREE, president of the E Star Electric and Engineering Co., Houston, Texas, called at the office of RADIO WORLD recently. Mr. Dupree was in New York buying goods for the fall and winter season of radio trade. He said that business at the Star headquarters in Houston has been brisk all summer, and that there has been no slump in activities, although sales had dropped off a little during August. However, he said, business has already taken a new turn and his concern will enter September with a good stock, encouraging local demand, and a fine prospect promise for the remainder of the year.

First Dubilier Dividend Encouraging

THE Dubilier Condenser and Radio Corporation has declared its first quarterly dividend of \$2 a share on its preferred stock, payable September 1, to holders of record of August 25. The corporation reports that earnings in its first three months of operation—May, June and July—were more than five times the amount required for the preferred dividend for that period.

New Firms and Corporations

Notices in this department are considered as purely interesting trade news and published without compensation to us. We welcome trade news of this nature. All notices having an advertising angle are referred to our Advertising Department, and are placed under Classified Advertising at 5 cents a word, or as Display Advertising at \$5 an inch.

(The firms and corporations mentioned in these columns can be reached by communicating with the attorneys, whose addresses are given whenever possible.)

Western Radio Corp., Manhattan, specialties, \$10,000; G. F. McCoy, M. L. Hegarty, Ler J. Conlon. (Attorneys, W. E. Kennedy, 47 Cedar St., New York.)

Amplitone Co., Manhattan, make telegraph and telephone instruments, \$15,000; R. Ely, D. Cohen, A. C. Knoeller. (Attorneys, Hedges, Ely & Frankel, 165 Broadway, New York.)

Bruno Radio Corp., Manhattan, \$5,000; M. Singer, E. Greenfield, L. Kaye. (Attorneys, Eppstein & Axman, 175 5th Ave., New York.) Radio Wet Wash Laundry Co., Manhattan, \$10,000; S. and M. Goldberger, M. Elevisky. (Attorney, S. E. Oppenheim, 203 West 106th St., New York.)

The Millard Radio Corp. has changed its name to Yankee Roll Co. of New York, Inc., New York.

William C. Cosby, Box 338, Abeline, Texas.

constructed of the highest-grade materials throughout—molded bakelite base, jewel ammeter, and oversized silicon steel transformer. There are no frail castings to break, as all parts are made from highest quality stampings.

Last-Minute Radio News!

What is considered an unprecedented feat of radio engineering was the starting, by radio, of a train of thirty-three cars of electrical apparatus from East Pittsburgh. The train, with its cargo which is destined for Chile, weighed 2,400,000 pounds and measured 1,300 feet.

Russia's new radio station in Moscow was able to receive messages from the diplomatic conference in Genoa. The receiving apparatus is entirely of Russian construction. The station has two masts each 560 feet high.

The wireless between England and Spain, which has been handled for some time by land wires to the Poldhu station and thence by radio, has been greatly improved by the substitution of the new Marconi station at Ongar as the transmitting agency. This station is worked by distant control from London. Messages filed in that city are sent direct by radio without any retransmission.

A summons for criminal libel brought against H. J. Kenner, manager of the Better Business Bureau, at No. 61 Broadway, New York, was dismissed by Magistrate Ronaud in Tombs Court. The summons was obtained by Charles Beadon, stockholder in the International Radio Corporation. The bureau alleged that the corporation had sold its stock through misleading statements in advertisements.

While off the Irish coast the radio operator of the Cunard liner, "Carmania," picked up a message, asking that the ritual for burial at sea be sent in full. The request came from the Canadian government steamship, "Canadian Trooper," whose captain found he had no prayer book when confronted with the necessity of burying one of the firemen at sea. The "Carmania" supplied his need.

During the coming week, and coincident with the opening of the college year, a new and unique radio-broadcasting station, officially listed in the Government call book as WHAZ, will be opened under the direction of the Electrical Engineering Department of the Rensselaer Polytechnic Institute at Troy, New York.

\$41,000,000 radio company files papers at Dover, Delaware: Canadian-American Radio Co., \$41,000,000; Frank Kweton, West New York, N. J.; L. F. Sniffin, Yonkers, N. Y.; Earl L. Keys, New York. (Corporation American Radio Co.)

Radio accessory factories of Canada are running under pressure, with three shifts for each 24 hours. Conditions prevail similar to that in the days of the war when factories were on munition work.

Consolidation of the Prima Radio Corporation of New York and the Manufacturers Tool and Die Works under the corporate title of the Prima Radio Corporation announced. The capitalization of the new company is \$50,000 8 per cent. preferred stock of \$10 par value and 1,500,000 shares of \$1 par value common. William Schilling is president and Andrew E. Puckrin is chairman of the Board of Directors.

Examinations for Radio Operator in Fourth District

EXAMINATIONS for commercial and amateur radio-operator licenses will be conducted by a radio inspector connected with the Navigation Service, Department of Commerce, at the following points in the Fourth Radio District on the dates indicated:

Florida—Miami, September 22; Key West, September 25; Tampa, September 29; Sanford, October 2; Jacksonville, October 4.

Georgia—Savannah, October 9; Macon, October 12; Atlanta, October 14 (amateur only); Atlanta, October 16 (commercial only).

South Carolina—Greenville, October 21; Columbia, October 24; Charleston, October 27.

North Carolina—Wilmington, October 31; Raleigh, November 2.

To Check Trade Abuses

DAVID N. MOSESSESOHN, executive director of the Associated Dress Industries of America was interviewed recently by "The Times," New York, regarding the resolutions passed by the National Retail Dry Goods Association suggesting means for alleviating trade abuses and to promote growth and cooperation in the relations between manufacturers and retailers. Mr. Mosessehn said, in part:

The first consideration is a definitely and

carefully worked-out code of ethics. This code should embody all of the basic principles of proper dealings between wholesalers and retailers. Each of the basic principles should then be subdivided into the various applications that would govern the operations of both wholesalers and retailers. Both the principles and the sub-divided applications should be clear and concise, leaving no room for doubt or quibbling.

This is the work of a small selected group of not more than seven or nine men, including representatives of manufacturers and of retailers and one or two men whose experience in organization work can be relied upon to iron out all of the technical problems which are sure to arise in the preliminary preparations. It is essential that the code of ethics be fool proof. It should be constructive. It should be so compiled that confidence would be inspired by it and that both manufacturers and retailers would prefer to follow its dictates of their own free will, rather than regard it as a club over their heads.

It is not sufficient that the individual associations in the wholesale and retail fields should exercise jurisdiction over their respective memberships. The retail associations should have a joint board, and the manufacturers' and wholesalers' associations should also have their joint boards. In other words, the entire retail and wholesale fields should be operated under two respective jurisdictions, whose authority would be inclusive of an entire field. The joint boards, in turn, might be represented on one supreme conference, or arbitration board. Reports of unethical practices in

Coming Events

The editors of RADIO WORLD will gladly publish news items of all contemplated radio shows and expositions. Keep us posted by mailing full information.

ANNUAL SHOW OF THE ST. LOUIS RADIO ASSOCIATION, St. Louis, Mo., October 4 to 7, inclusive.

CHICAGO RADIO SHOW, Coliseum, Chicago, Ill., October 4 to 22. U. J. Hermann, managing director, 549 McCormick Building.

KANSAS RADIO EXPOSITION will be held at the Kansas State Fair, Hutchinson, Kansas, September 16 to 22, inclusive. A. L. Sponaler, secretary.

RADIO CLUB OF AMERICA. First autumn meeting will be held the last Friday in September. Renville H. McCann, secretary, Columbia University, New York.

CINCINNATI RADIO-AND-ELECTRICAL EXPOSITION, Music Hall, Cincinnati, O., October 7 to 14, inclusive.

NEW YORK ELECTRICAL AND INDUSTRIAL EXPOSITION, Grand Central Palace, New York City, October 7 to 14, inclusive.

NEWARK'S SECOND ANNUAL RADIO SHOW, Robert Treat Hotel, Newark, N. J., October 4, 5, 6 and 7.

SECOND NATIONAL RADIO EXPOSITION, direction International Trade Exposition Co., Chicago, January 13 to 20, inc., 1923, George A. King, director of publicity, 417 South Dearborn Street, Chicago, Ill.

PERMANENT RADIO FAIR FOR BUYERS, Hotel Imperial, New York City. Open from September, 1922, to May, 1923.

AMERICAN RADIO EXPOSITION, Grand Central Palace, New York City, December 21 to 31, inclusive. Direction American Radio Exposition Company, 120 Broadway.

BOSTON RADIO EXPOSITION, AND NEW ENGLAND AMATEUR CONVENTION, Mechanics Building, Boston, October 30 to November 4, inclusive.

SPRINGFIELD RADIO EXPOSITION, Springfield Auditorium, Springfield, Mass., October 3 to 7, inclusive.

ELECTRICAL RADIO AND AUTOMOBILE ACCESSORY EXPOSITION, Smith's Academy, Passaic, N. J., September 14, 15, 16.

either the wholesale or the retail field, should be filed with the joint board in that field, the authority of which should be great enough to correct the error or pass judgment on such action as might be deemed advisable in the premises. If doubt exists as to the extent of authority vested in the joint board, or where a principle or policy is involved that requires the judgment of a 'highest authority,' the matter should be placed in the hands of the conference or arbitration board. This board should be only advisory, but should have power to recommend action to be taken by the joint boards.

To Study Foreign Electrical Development

TO make a study of electrical development, including radio operation and equipment, R. A. Lindquist, chief of the Electrical Equipment Division of the Department of Commerce, has sailed for Europe. During a three months' survey, Mr. Lindquist will investigate the electrical appliance possibilities for American equipment in England, Sweden and Germany.

Change of Name

PIONEER RADIO PRODUCTS CO., 329 East 20th Street, New York City, manufacturers of radio equipment and new specialties, announce that hereafter the firm name will be Pioneer Wireless Products Co. This change has been made to avoid complication with concerns which have adopted similar names.

Subscribe direct or through your news dealer. \$6.00 a year, \$3.00 six months, \$1.50 three months. Radio World, 1493 Broadway, N. Y. C.

"MIRAD"

"Quality Radio Priced Right"

3 Plate Variable Condensers.....	\$1.50
Mirad Varicouplers	3.75
3000 Ohm Double Head Phones.....	6.00
1500 Ohm Single Head Phones.....	3.00
(Money back guarantee.)	
Mirad 23 Plate Condenser.....	3.95
Mirad 43 Plate Variable Condenser.....	4.95
Mirad Detector Unit.....	\$8.00
Mirad Two-Step Amplifier.....	29.00
Postage Paid	

Dealers' Sample of Above 25% Off

Miracle Radio Mfg. Co.
INTERURBAN BLDG., DALLAS, TEXAS

Buy Your Radio Receiving Set at Manufacturers' Cost

Buy your Radio Supplies at a large discount below the list or retail price. If a saving of \$15.00 to \$140.00 on a Radio Receiving Set or if a saving of 25% to 40% on Radio Supplies interests you, write or telegraph us today.

KING RADIO MFG. COMPANY
521 Penn Ave. Wilkesburg, Pa.

Will Cut Out Singing

THE output circuit of a modulator will contain a certain number of oscillations of high and low frequency, one at least of which consists of a carrier wave of double the original carrier frequency and modulated in accordance with the original signal.

This component of the output may be selected out by suitable circuits and, after amplification, may be transmitted to a remote station. This modulated doubled frequency will cut out "singing."

Radio Rappings Mystify Magician

HOWARD THURSTON, magician and psychic investigator, has just publicly announced that he is ready to admit that the belief in spiritistic communication expounded by Sir Arthur Conan Doyle and Sir Oliver Lodge, which he has ridiculed up to date, is actually founded on something tangible.

"My latest experiments," said Mr. Thurston, "have firmly convinced me, much against my will, that we are nearly always being approached by some unearthly forces which seem to be trying to impart to us or receive from us some information."

"During a recent series of tests, I was astounded, on several occasions, by the unmistakable presence of a very definite supernatural influence which seemed to be attempting to transmit some sort of a message to me or through me. These tests were carried on partially by the aid of a powerful semi-radio outfit of my own invention. And I wish to state most emphatically that if the unintelligible though distinct impressions received by me were not communications from spirits they must have been communications from other planets."

"Recently, I arrived at the conclusion that many of the planets, if not all, were inhabited by beings, spiritual or physical, who are similar to us in mentality, at least, and that in the course of time they will get into intelligible contact with us. In fact, I think they have been trying to get in touch with us for a long, long time and that it is barely possible that their signals which have been received by the highly sensitive ones among us, the real mediums, have been mistaken for messages from our departed friends and relatives. And, then again, it is barely possible that the other planets are populated by the spirits of those who have gone before us, reincarnated or otherwise. Who knows!

"I believe that any highly sensitive person with an ability to concentrate can, at times, receive the so-called spiritistic com-

munications. However, I do not think there is a man or woman living who can clearly translate them at the present time. We are on the brink of some startling psychic discoveries and the radio invention will be at least partially responsible for these disclosures. I am positive that the scientists who are back of the coming attempts to 'wireless' to Mars are going to bring some astounding facts to light, quite accidentally, in all probability. I feel sure that there is a direct connection between occult force and radio power."

Mr. Thurston says that he is not ready to give a description of the machine he is using, but that electricity is utilized.

Attention

Vacuum Tube Users

SAVE \$1.50 ON DETECTORS SAVE \$3 ON AMPLIFIERS

REPAIRING

Marconi, Moorhead, Electron Relay, A. P. Radiotron UV200-UV201
Cunningham C-300-C-301
Detectors for \$3.50 Amplifiers \$3.50

Prompt Deliveries, Satisfactory Results
Reasonably Guaranteed

GEO. H. PORELL CO., INC.
OUTTER SQUARE WEST SOMERVILLE, MASS.

Our Free Catalogue

Is Yours For the Asking—It Tells All About Our Wonder Sets, Vacuum Tube and Loose Coupler, also

Little Wonder Crystal Set

A Practical Receiving Set Within Reach of Everybody's Purse.

\$2.50 Unmounted Mounted, \$4.00

Radi-O-Plate Panels to Order.
All sizes cut as specified.

Holloway Electric Supply Co.
238 THIRD AVE. NEW YORK
Phone Gramercy 5628

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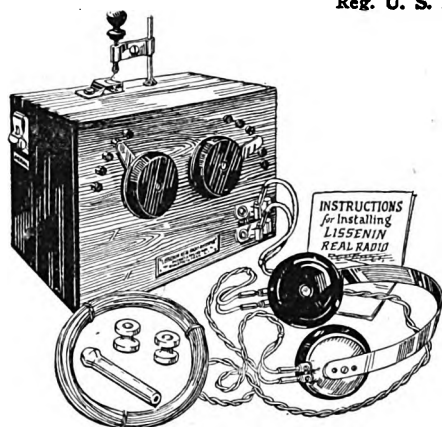
A Real Radio Receiver

Guaranteed as represented
or Money Refunded

Head Phones, Cord and
Headband Included for Only

\$9.75

Complete



Consists of double-connected tuning coil. Wound to the critical point, with condenser, permitting of very close tuning and clearest reception. Detector admits of 3 motions of finder. Holds mounted or unmounted crystals. Fine cheery finished solid box. Complete ANTENNA Equipment, with installation instructions, and Galena Crystal.

The achievement of the LISSENIN REAL RADIO RECEIVER is the wonder of the RADIO AGE. Gets concerts, market reports, crop news, baseball and prize fights. Radius 25 to 30 miles according to local conditions. Code 300 miles and more.

It's complete. Nothing else to buy. Just LISSENIN.

Send check or money order for \$9.75 and get your set Now. Extra pair phones \$4.75.

LISSENIN RADIO CO.

24 Paulison Avenue

Ridgefield Park, N. J.

Welcome! Come in and hear the

Coraco

Radio Concert

Daily, 9 A. M. to 5 P. M.

18th Floor, 220 W. 42nd St., next to
Amsterdam Theatre

The Coraco Super-Radiophone is the latest and greatest improvement in radio, it has no outside connections—no installations expense—is as simple to operate as a phonograph. If you cannot call, write for full information.

The Coraco Company, Inc.
220 West 42nd Street New York

86,960 NAMES

Increase your sales by using names and addresses of firms and individuals interested in everything in Radio.

310 Radio Manufacturers in the U. S.	\$2.00
650 Radio Supply Jobbers in the U. S.	5.00
6,500 Retail Radio Dealers in the U. S.	35.00
5,000 Amateur and other owners radio apparatus	10.00
25,000 Amateur and other owners radio apparatus	40.00
50,000 Amateur and other owners radio apparatus	75.00
Amateur Radio Directory of the U. S. Complete list of Amateur stations with names and addresses of operators or owners. Prepaid for \$8.00. Names and addresses are guaranteed 98% correct will refund postage on all mail returned as undeliverable if less than 98%. Remit with order.	

SUBSCRIPTION AGENCY

1021 Carrington St. Jamestown, W. Va.

If you did not get a copy of Radio World No. 1, send us \$6.00 and we will send you this paper for one year, and start it with our first issue, which will be mailed you as soon as possible after receipt of order.

The Nelson Radio Parts Co.

Manufacturers and Distributors of

RADIO APPARATUS

Write for Catalog.

80 ACADEMY STREET, NEWARK, N. J.

Tel. Market 4066

Rocky Mountain Crystals

BETTER THAN GALENA

The most sensitive mineral rectifier known. Can also be used with one or more stages of amplification.

Mounted, 35c.; Unmounted, 20c.; Postpaid Manufacturers, Jobbers, Dealers, Clubs, Apply for Special Trade Prices

Rocky Mountain Radio Products, Inc.

9 CHURCH ST., NEW YORK, N. Y.

Law Storage Battery

Constant voltage, large amperage. Will run two months without recharging.

Attractive Dealers' Discounts

Write for Details

WILLIAM LAW COMPANY

Aborn and Sabin Streets, Providence, R. I.

Radio Supplies

Variocouplers, Variometers, Headsets, Transformers, Sockets, Rheostats, Etc.

Guaranteed 25-Mile Crystal Set \$4 Or Money Refunded PRICE,

Send fifty cents for 20 efficient blue-print hook-ups.

Any Radio Set Made to Order or Repaired

Sunbeam Electric Co.

71 THIRD AVE. NEW YORK

The GOODMAN

Is the Niftiest Short Wave Tuner on the Market

Only \$6.00 & PP on 1 lb.

Send for pamphlet.

Order through your dealer.

L. W. GOODMAN

Manufacturer

DREXEL HILL, PA.

Dr. Miller, of Chicago, writes: "My perfectly good variometers and vario-coupler now go into the discard."

No Aerial No Loop No Lamp Socket Attachment

ONLY—

RADIO-DUCT

—AND A GROUND CONNECTION

Sold in 10-Foot Rolls

At \$1.00 per Roll

IF YOUR DEALER HAS NOT GOT IT WE WILL SHIP DIRECT UPON RECEIPT OF YOUR REMITTANCE.

Columbia Electric Motor Co.

1414 ADAMS STREET

HOBOKEN

NEW JERSEY

Telephone: 3731 Hoboken.

Broadcasting Still Growing

THERE were 487 broadcasting stations licensed by the Department of Commerce up to August 26, licenses for 16 of which were issued during last week, while only one ceased to function—KZZI, a station operated by Irving S. Cooper in the radio-crowded city of Los Angeles was dropped from the roll, so to speak. This station is one of scarcely half a dozen to stop broadcasting after undertaking the new and fascinating game of entertaining by the ether.

During the month of July, 76 broadcasting stations were opened in 68 different cities; Butte, Cedar Rapids, Hollywood, Joplin, Rockford, Ill., and Washington, D. C., getting two each; while Lincoln had three. The radio broadcasting boom is still on!

The following are the 16 new limited commercial or broadcasting stations licensed during week ending August 26:

WLAD—Arvanette Radio Supply Co., Hastings, Neb.
KFBN—Borch Radio Corp., Oakland, Cal.

WLAF—Johnson Radio Co., Lincoln, Neb.
WKAM—Adam Breede, "Daily Tribune," Hastings, Neb.

WKAL—Gray & Gray, Orange, Tex.
WKAR—Michigan Agriculture College, East Lansing, Mich.

WKAK—Okfuskee County News, Okemah, Okla.

WMAM—Beaumont Radio Equipment Co., Beaumont, Tex.

WKAT—Frankfort Morning Times, Frankfort, Ind.

WMAH—General Supply Co., Lincoln, Neb.

WLAB—George F. Grossman, Carrollton, Mo.

WKAU—Laconia Radio Club, Laconia, N. H.

WKAS—L. E. Lines Music Co., Springfield, Mo.

KFDB—John D. McKee, Lombard & Kearney, San Francisco, Cal.

WNAL—R. J. Rockwell, Omaha, Neb.

WKAW—Turner Cycle Co., Beloit, Wis.

Radioman a Hero

CHIEF RADIOMAN CLAUDE G. ALEXANDER has been commended by Acting Secretary of the Navy Roosevelt for his exceptional bravery in rescuing the pilot of a burning airplane at the risk of his own life.

Chief Alexander was a passenger in a naval plane, piloted by Ensign Ralph R. Auerswald on a cross-country flight in July, when the plane crashed near Encinitas, California, and almost immediately burst into flames. When the plane struck, Alexander managed to crawl out of his seat and release Ensign Auerswald's safety belt, lifting the unconscious pilot partly out of his cockpit before an explosion occurred, throwing Alexander clear of the wrecked plane. When he regained his feet, he saw Auerswald pitch headforemost out of the burning plane to the ground; picking him up, the gallant radioman carried him bodily to a place of safety. Chief Alexander's home is in Seward, Alaska, but he is attached to the U. S. S. "Arroostook," flagship of the Pacific Air Squadrons now at Mare Island, California.

Radio Train-Control

A NUMBER of attempts have been made to place locomotives under the control of the mysterious radio wave. None of them has been successful. But if battleships can be controlled in this fashion why not locomotives? asks the "Evening Mail Radio Review," New York. A safe and reliable radio train-control that would prevent railroad wrecks would be worth a lot of money to its inventor. Incidentally that inventor would be doing a great deal for humanity.

LOMBARDI

Vernier Variable Condensers

Best on the Market. Fully Guaranteed. All Sizes. Dealers Write!

THE PLYMOUTH ELECTRIC CO.

155 Court Street New Haven, Conn.

RADIO BOXES

All radio carpentry work our specialty. Write for SPECIAL PRICES

JOE MIFSUD & CO.

373 Canal Street New York City

Telephone—Canal 8478

Manufacturers of Radio Accessories

Eastern Radio Mfg. Co.

MAX RAHTHUS, Pres.

65 WEST BROADWAY

Near Murray Street

NEW YORK CITY

"SPAGHETTI" VARNISHED TUBING

"EVERYTHING IN INSULATION"

VARNISHES, COMPOUNDS, PAPERS, ETC.

MITCHELL-RAND MFG. CO.

24 VESEY ST., NEW YORK, N. Y.



BUILD YOUR OWN

Complete 50c. instruction book for 20c. only on radio reception and how to make eight classes of crystal and vacuum tube receiving sets. Wonderful information makes you understand radio. With every order we send free our price list of parts prepared especially for the several sets described. Buy direct from factory and save many dollars. Both instruction book and price list sent on receipt of 20c. only. Money back if not pleased.

RADIO PARTS MFG. CO.

Dept. 15, Park Pl. W., Detroit, Mich.

GOING—and Going Fast

We have only a few left and they are going fast, but while they last we will continue to sell them at the reduced price.

VT 1 Detector and Amplifier.....\$7.50

VT 2 Detector and Amplifier.....\$8.50

The above tubes are the genuine army J's and W's, respectively.

"RADIO BUILDER" PLANS FREE!

By Mail, 5c.

LIBERTY RADIO CO.

106 Liberty Street New York City

COMPLETE RADIO SET

READY TO LISTEN IN

\$14.50 C. O. D.

FOR THE COMPLETE SET

INCLUDING AERIAL

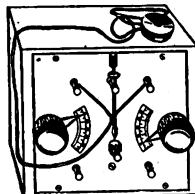
(Regular price: \$25)

This outfit is intended for the fan that appreciates a good thing. It includes a high grade tuner with a 40 to 60 mile radius, 1300 ohm phone, insulators, and complete aerial set.

SEND NO MONEY unless you wish. Simply send us your name and address, and we will mail immediately. You pay Postman on arrival, our price, plus postage. Satisfaction guaranteed, or money refunded.

THE UNWIN TRADING CO.

55 BROADWAY NEW YORK



KNOCKED-DOWN

VARIABLE CONDENSER

MONEY-SAVING PRICES

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48	.001	\$5.50	\$5.00

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Linking the Americas by Radio

Three New Central-American Stations Will Embrace 54,000 Square Miles of Broadcasting Territory

By P. Boucheron

THE Radio Corporation of America has received orders from the United Fruit Company and the Tropical Radio Telegraph Company for five radio stations, three for Central America and two for the United States, each with a sending radius of more than 2,000 miles. The erection of these five stations will fill an important and essential gap in the radio communication system of the Americas.

The three Central American stations will be located on the corners of the triangle embracing Honduras, Nicaragua, and Panama. The Tropical Radio Telegraph's stations will be located at Managua, the capital of Nicaragua, and at Tegucigalpa, the capital of Honduras, the city designated as the capital of the new Central American Union. These stations will connect with the United Fruit Company's station at Panama.

The United States terminals of this communication system will be at New Orleans, where the present station of the Tropical Radio Telegraph Company is to be enlarged and new apparatus installed, and at a new station which the Tropical Radio Telegraph Company will erect in the vicinity of Miami, Florida. Intercommunication between these five stations, and ship-to-shore communications with them, will open up entirely new routes of communication between the Americas, one of which will be the opening of the radio route between Bogota, Colombia, and the United States, a distance of more than 2,000 miles.

The area embraced by the three Central American stations includes approximately 54,000 square miles, Managua, Almirante, and Tegucigalpa being separated by 150, 360, 460 miles respectively. Communications originating within the Central American States may be telegraphed over short distances by land wires to the triangle-group stations, then dispatched by radio to the United States or South America by the New Orleans or Bogota stations. Because of the layout of the three stations, service from nearly all parts of Central America is practicable. In fact, the system is designed to tie in all points from Southern Panama with North and South America.

Equally as important as the land and over-sea communication aspects of this new radio system is the announcement that the tropical stations will be used for ship-to-shore radio service by vessels plying the waters of the Atlantic Ocean, Gulf of Mexico, Caribbean Sea, and the Pacific Ocean.

The radical changes in the technical design of modern radio telegraph apparatus, the results of the combined efforts of the Radio Corporation of America and the General Electric Company, will be incorporated in the manufacture of the apparatus used in this intercontinent communication project. Years of exhaustive practical tests have slowly eliminated undesirable features of radio telegraph apparatus.

Vacuum tubes of the latest design, and many times more powerful than any tubes heretofore used in sets for commercial service, together with the highly efficient multiple-tuned antenna, will form some of the special features of these new stations. The wave lengths used will range from 2,500 to 4,500 meters, and the power actually delivered to the antenna at these wave lengths will be equivalent to over 100 kilowatts or the spark- or damped-wave apparatus.

It is worthy to note that in the case of the Tegucigalpa, Honduras, station the delicate radio apparatus, as well as the heavy steel members used in the construction of the 437-foot towers must be transported over an 80-mile mountain trail. It is expected that this station will be placed in operation in two months.

Record for Receiving Continental Code

EDITOR RADIO WORLD: In RADIO WORLD, August 5th, you make a statement in reply to an inquiry by Mary Mathews, Montreal, Canada, that the record for receiving Continental Code is 56½ words a minute, made by L. R. McElroy, of Boston.

I beg to inform you that a test was held some years ago by Mr. Vaughn, chief engineer of the G. P. O. telegraphs and telephones for the north of England, in which a Manchester telegraphist reached the speed of 80 words a minute. It was impossible to write down at that speed, so the message was just read off. If you have any record to beat that in the State I would be pleased to hear of it. NEAL PURTILL, late operator, City School of Wireless Telegraphy Manchester.

Winnipeg, Manitoba, Canada.

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While every possible care is taken to state
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time and controversy in matters over which the
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Will Be More Common Than Telephone

THE future of radio telephony lies largely
in its entertainment and amusement
value. There are comparatively few Amer-
icans who have not heard concerts, funny
anecdotes or public speeches by radio," says
Meade Brunet, sales director of the Radio
Corporation of America.

"Radio is the solution of the 'Back to the
Farm' movement. To keep the boys down
on the farm all you have to do is install a
radio receiving set in your front porch, and
they can hear the best music and entertain-
ment without going to a city.

"Within a few years the radiophone will
be more common than the telephone because
of its humorous and cultural value for all
kinds of families.

"Everything broadcast must be capable of
appealing to the finer sensibilities. No risque
stories can be sold, no discordant tunes can
be played and the moral standard of public
taste is going to be raised."

A 300-Mile Aerial

TEMPORARY use of an aerial nearly
300 miles long enabled R. C. Black-
well, general repeater chief in the Postal
Telegraph and Cable Company's main of-
fice in Chicago, to hear distinctly a talk
made by Ty Cobb, manager of the Detroit
Tigers, which was broadcast recently
through the Detroit "Free Press" station
WCX. With the cooperation of Joseph M.
Richardson, night chief operator in Detroit,
Mr. Blackwell "killed" one of the trunk wires
between the two cities by taking off the bat-
teries. He then attached his home-made re-
ceiving set in the Chicago office. Proximity
of the Postal wires to the "Free Press"
aerial in Detroit made the long line a per-
fect conductor. The use of a double set
of variable condensers was productive of
improved results.

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RADIO WORLD, 1493 Broadway, New York City.

Auction of Radio Equipment

APPROXIMATELY fifty complete radio-
telegraph transmitting and receiving
sets located at Norfolk, Virginia, will be
sold by the Shipping Board on or before
September 15. The sets are surplus equip-
ment of the board, such as are now used
on service vessels and known as Navy
Standard Type 1 K. W. sets. The apparatus
was manufactured by American Marconi
Company, Kilbourne & Clark, E. J. Simon,
and other reputable American radio build-
ers. A large quantity of other apparatus
and parts, such as transmitters, crystal de-
tectors, motor generators, batteries, coils,
insulators, panels, rheostats, switches, trans-
formers, and other component parts, ex-
cepting receivers, is also awaiting purchas-
ers at the Shipping Board's warehouse at
Norfolk.

Radio and Politeness

I WAS listening to a radio concert—real
stuff—overture to "Tannhaeuser"—when
a strident voice burst upon the ether waves
and this is what I heard, writes Bruno
Lessing, in "The American," New York.

"Hello, Bill? D'ye get me, Bill? This
is Howard. Ah—uh—say, Bill, how's the
new set working? 'Zat so? Say, Bill—ah
—uh—ye didn't forget number twenty-eight,
did ye? What's that? Talk up, Bill."

It kept up for ten minutes, during which
the concert—as far as my receiving set was
concerned—went bla-a-ah.

Through the kind offices of an authority
on radio I was able to obtain Howard's
telephone number and I called him up.

"Do you realize," I asked, "that thousands
of people were listening to a concert and
that you spoiled all their pleasure by using
your sending set?"

"Well, what about it?" he replied. "Is
it against the law?"

Courtesy has often been called the virtue
of kings. If that be true we are the most
democratic country in the world. When
Columbus landed courtesy departed.

Listen to the average conversation be-
tween chauffeurs or truck drivers whose
vehicles have become entangled, watch a
crowd trying to get into a moving picture
show, note the demeanor of sales-people in
a store chatting with one another while
customers are waiting, follow a poor Italian
or Jewish or Greek peddler while he tries

to obtain an interview with a public official;
follow any poor person anywhere and watch
him try to get anything. And keep your
eyes open for courtesy.

The funny thing about it is that polite-
ness is one of the first results of education.
Most people bewail the fact that they do
not possess the education they desire. They
want to learn.

The trouble is that they all want to begin
with biology or history or languages or
philosophy and not with politeness and
grammar.

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10,600 to 16,900	600	1,000	Shunt

Value of the "Wave Antenna"

MANY radio enthusiasts who have been bothered by interference arising from atmospheric electricity, or from other transmitting stations, have wondered how the great commercial receiving stations were able to pick up in a reliable manner the signals from Europe, says "The Times," New York, especially during the summer months when static disturbances are at the maximum.

A few years ago, it was necessary for a receiving station to be located about fifty miles from another receiving station in order to prevent local interference when the transmitter was in operation. It is now possible to minimize static and prevent interference from nearby transmitting apparatus by the use of a new antenna system known as the "wave antenna." One of the busiest receiving stations in the world is at Riverhead, L. I., and its efficiency may be attributed in a marked degree to the wave antenna system. A remarkable feature is its ability to tune out the powerful im-

pulses of the giant radio central, or the signals of New Brunswick, N. J., Tuckerton, N. J., and Marion, Mass., and thus copy messages from across the sea without the slightest interference when the nearby high powered transmitters are in operation. It is estimated by radio engineers that the wave antenna eliminates about 90 per cent. of interference created by atmospheric disturbances. The same system has been applied to ship communication with the result that ocean liners are in touch with the Cape Cod receiving station as soon as they clear the English Channel.

If a new transmitting station begins operation in Europe the only work necessary at Riverhead for reception of its signals is in the installation of a new set of receiving instruments on a shelf which stands ready for increased business.

A Prediction

Those who have faith in the radio industry would not be surprised if as much as \$30,000,000 worth of radio equipment is purchased during the holiday season.—"The Mail," New York.

—Let Your Apparatus Speak for Itself—

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—A national exposition for radio manufacturers, dealers, inventors and amateurs, covering the entire field of radio.

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—Educational and Interesting—

British Fans Want Compact Tube Sets

ENGLAND is beginning to purchase radiotelephone sets and listen in to British and Continental broadcasters, according to John H. Grout, United States Consul at Hull, England, who explains that wireless telephony is becoming popular in private use, especially in Hull where about fifty receiving sets are in operation.

Broadcasting stations in England are expected to be in full operation, sending out programs such as are now enjoyed in the United States, within two months, and twenty British electrical firms are manufacturing receiving apparatus.

Although both crystal and vacuum-tube receivers, or "valve sets," as the British call them, are used, the latter is the more popular, except for those who prefer only local entertainment. In Hull, two- and three-valve sets are preferred. More of these sets would be used, it is believed by the American Consul, if they were available. In England they are manufactured principally in London, Birmingham and Manchester, selling in Hull for about \$51. A two-valve set connected with variable inductance and a variable condenser is found sufficient to receive the Hague concerts on 1,070 meters, and the Eiffel Tower broadcasts on 2,300 meters. Most of the fans around Hull use double vertical aerials with a receiving length of 150 feet, including the lead in, the British maximum for receiving. Permission of the Postmaster General in London is necessary before setting up a receiving set, and the license fee is \$2.43. Oscillating valves are not permitted except in transmitting sets, and a very few transmitting sets are used, the interest being centered on listening in at home.

American manufacturers will find British purchasers most interested in compact, vacuum-tube sets, and a list of Hull electrical dealers has been sent to the Department of Commerce for consultation.

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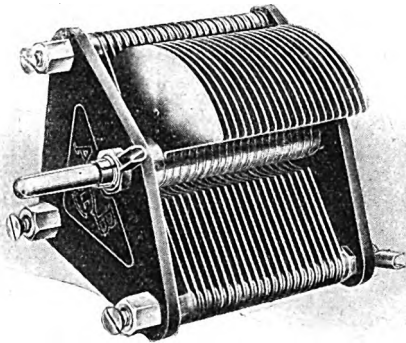
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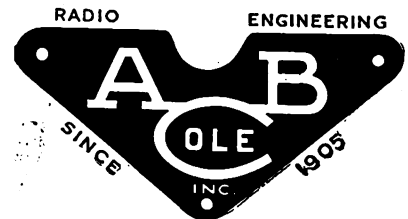
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The rate for this RADIO WORLD QUICK-ACTION CLASSIFIED AD. DEPT. is 5c. per word (minimum of 10 words, including address), 10% discount for 4 consecutive insertions, 15% for 13 consecutive insertions (3 months). Changes will be made in standing classified ads., if copy is received at this office ten days before publication. RADIO WORLD CO., 1493 Broadway, N. Y. C. (Phone, Bryant 4794.)

PATENTS—Electrical cases a specialty. Pre-war charges. B. P. Fishburne, Registered Patent Lawyer, 386 McGill Bldg., Washington, D. C.

Manufacturers of Rogers Radio Receivers and Rogers Receiving Radiometers. Rogers Radio Company, 5133 Woodworth Street, Pittsburgh, Pa.

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Exchange jolly interesting letters through our Club! Stamp appreciated. Betty Lee, 4254 Broadway, New York City.

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FOR SALE—Clapp-Eastham H. R. Receiver \$30.00; Western Electric Loud-Speaker, \$140.00; Atwater-Kent Variometers, \$6.50. H. B. Rogers, Cainsville, Missouri.

REGENERATIVE SETS below cost—Variometers, variocoupler-detector, two stage amplifier, jack control, complete, \$45.00. Caverley, 4744 Winthrop Ave., Chicago.

BUY RICO TRI-POLE HEADSET, \$6.40 or \$7.50; get \$3.00 or \$4.00 Variable Condenser free. Wonderful discounts to dealers. WAGNER NOVELTY CO., DEPT. R., DELPHOS, OHIO.

PATENTS—Send for form "Evidence of Conception" to be signed and witnessed. Form, fee schedule, information, free. Lancaster & Allwine, 259 Ouray Bldg., Washington, D. C.

CASH FOR OLD GOLD, Platinum, Silver, Diamonds, Liberty Bonds, War, Thrift, Unused Postage Stamps, False Teeth, Magneto Points, Jobs, Any Valuables. Mail in today. Cash sent, return mail. Goods returned in ten days if you're not satisfied. OHIO SMELTING CO., 337 Hippodrome Bldg., Cleveland, Ohio.

RADIO ENGRAVINGS FOR SALE—We have a large stock of radio half-tone and pen-and-ink reproductions which are suitable for magazines, illustrations, booklets, circulars, advertisements, etc. Tell us what you want and we will quote rates. R. W., Room 326, 1493 Broadway, New York City.

MY REGENERATIVE RECEIVER, DeForest-Remler type, using duo-lateral coils and Harko 2-step amplifier. Wired in cabinet and including B batteries, tubes and phones. Price \$75.00. S. Burke, 919 Va. Ave., Cumberland, Md.

If you did not get copies of Radio World, No. 1 to No. 23 send us \$3.30 or we will send you this paper for one year, (\$6.00 for 52 issues) and start it with our first issue, which will be mailed you as soon as possible after receipt of order.

RADIO SETS

BUILD YOUR OWN RADIO RECEIVING SET. Complete directions with drawings and diagrams sent postpaid for 25c. SPECIAL: Best unmounted CRYSTAL DETECTOR on market sent postpaid for 40c. Send coin or money order today. Lowest prices on complete Receiving Sets and Parts. IMMEDIATE DELIVERIES. Complete catalog mailed free upon request. BASSETT RADIO SUPPLY CO., Reseille Station Dept. D. Newark, N. J.

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K. D. Variometers (with winding form).....1.75
Pioneer Wonder Brand Head Phones (500 Ohms) 4.50
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329 East 29th St. New York

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Elbee Radio Laboratories
1716 N. Wells Street Chicago

Pictures and Facts About Armstrong Amplifier

Radio World has published a number of pictures, diagrams and descriptive articles regarding the New Armstrong Super-Regenerative Amplifier. The numbers containing this material are dated June 24, July 8, July 15, and August 5. They will be sent postpaid on receipt of 15 cents each, the four copies complete for 60 cents. Or you can subscribe, \$6.00 year; \$3.00, six months; and have your subscription start with the number dated June 24. RADIO WORLD CO., 1493 Broadway, New York.

When Time Signals Are Transmitted

STARTING at five minutes before the time given for each station, time signals are sent out from the stations listed below. Each tick of a standard clock is transmitted as a dot, omitting the twenty-ninth second of each minute, the last five seconds of each of the

first four minutes, and, finally, the last ten seconds of the last minute. A dash is sent at the time given opposite the station.

All of these stations send out the time signal on the meridian standard time opposite their call. They are operated by the Navy.

STATION	CALL
Arlington, Va.	NAA
Key West, Fla.	NAR
New Orleans, La.	NAT
Darien, Canal Zone.	NBA
North Head, Wash.	NPE
Eureka, Cal.	NPW
Pt. Arguello, Cal.	NPK
San Diego, Cal.	NPL
San Francisco	NPG
Great Lakes, Ill.	NAJ

WAVE LENGTH	TIME
2500	Noon and 10 P. M. 75th meridian
1500	Noon and 10 P. M. 75th meridian
1000	Noon. 75th meridian
4000 (CW)	1 P. M. 75th meridian
2800	Noon. 120th meridian
2300	Noon. 120th meridian
1512	Noon. 120th meridian
2400 (CW)	Noon. 120th meridian
2400	Noon and 10 P. M. 120th meridian
1512	11 A. M. 90th meridian

No Danger from Radio Power

Dr. Charles P. Steinmetz, consulting engineer, General Electric Company, was asked the following question during his visit to the Radio Congress, Chicago:

"Dr. Steinmetz, many of us have amateur radio-receiving sets in our homes. We have heard rumors that the underwriters consider that there is a fire hazard because of the antenna and the ground connections, and that certain restrictions may be placed on amateur installations. We would like to have your opinion as to the real hazard involved."

Dr. Steinmetz replied as follows: "There is no hazard in the amateur radio receiving station. It involves no fire risk nor risk to life. It is merely a harmless toy, but is a great deal more than a toy. It is one of the most valuable developments of recent years, by its instructive and educational value and the recreation and pleasure which it supplies. It would, therefore, be very regrettable if by a misguided public opinion obstructions were placed in the way of the fullest and freest development of the amateur radio station. With regard to the possible lightning risk from the grounded antenna: first, the lightning risk in a city is very remote in any case; and, second, the grounded antenna rather acts like a lightning rod and exercises a protective action

against lightning. Any danger from the radio power received by the amateur station obviously is ridiculous when considering that the energy of a single pound of coal would be more than enough to operate the radio receiving-station continuously for over a thousand years. Certainly this is not enough energy to do harm."

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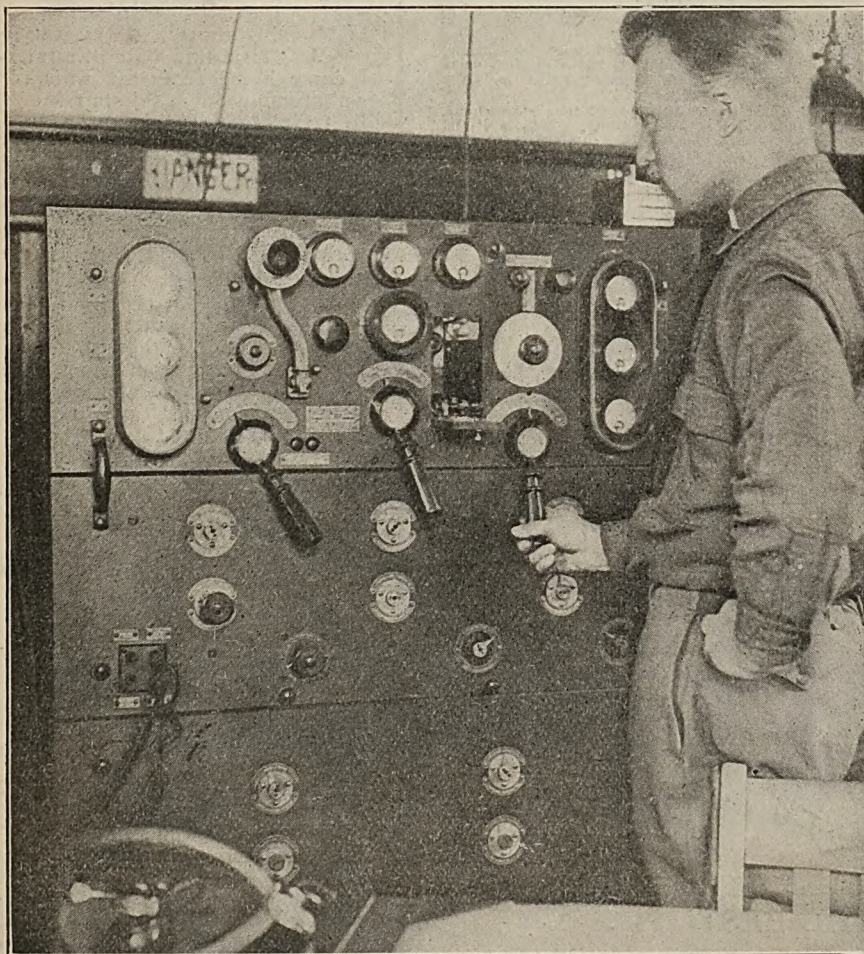
Subscribe direct or through your news dealer. \$6.00 a year, \$3.00 six months, \$1.50 three months. Radio World, 1493 Broadway, N. Y. C.

RADIO WORLD

Entered as second-class matter, March 28, 1922, at the post office at New York, New York, under the act of March 3, 1879

I L L U S T R A T E D

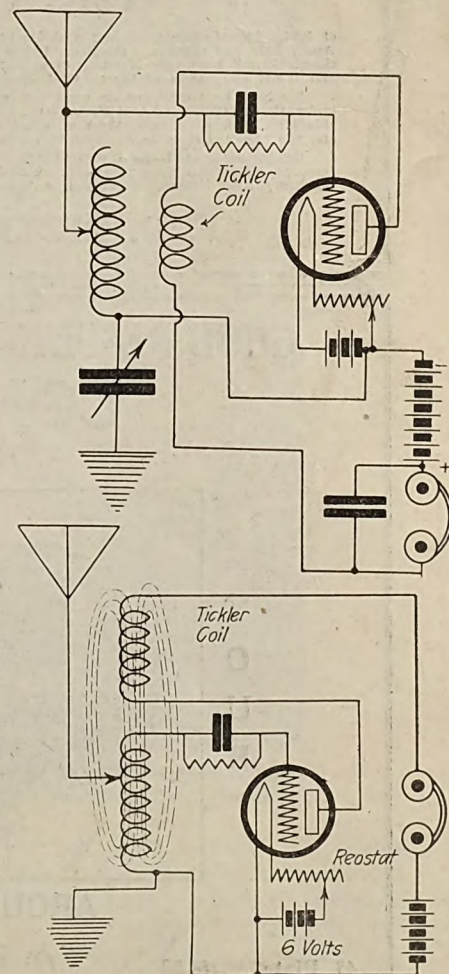
Where Uncle Sam Radios to His Millions



(C. Underwood & Underwood, N. Y.)

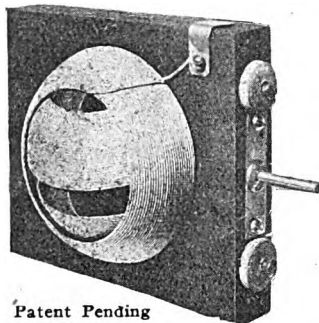
The radio transmitter that hurls forth the radio waves generated by the vacuum tubes in the big United States broadcasting station, WVP, Fort Wood, Bedloe's Island, New York. This station operates on a wave-length of 1,450 meters, and covers one of the widest ranges of territory in America.

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Here are two simple regenerative hook-ups you will want to test out. See article on page 13.

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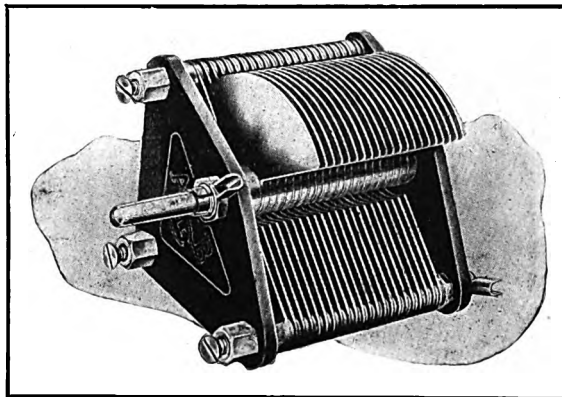
of Radio Manufacturers, Jobbers and Dealers in the United States and Canada. Issued Quarterly—January, April, July and October. October, 1922, issue corrected to September 15th, 1922. Classified under three different headings—Manufacturers, Jobbers and Dealers—and alphabetically arranged by states, cities and towns and names of firms. Containing approximately 15,000 names and addresses.

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RADIO WORLD, 1493 Broadway, New York City

Disappointed

(Cartoon by L. B. Hinckley)



Willie: "Aw, lay off! And I just got that station tuned in swell, too!"

Good Morning, Mrs. Casey

"GOOD mornin', Mrs. Casey, 'Tis a fine state of affairs— I come home from my washin' An' stumble down th' stairs. In tryin' to find th' reason, Sure, what d'you think I found? 'Twas nothin' but a copper wire A runnin' to the ground. I followed up this copper wire An' faith, 'twas pretty soon, It led me to the attic floor, Where Jimmy has his room.

"I thought that Jimmy was in school, Instead, what did I see? Th' lad had ear muffs on his head, On his face a look of glee. 'Oh, mom,' he said, 'Come over here And listen in on this— I'm getting everything so clear, Without a single hiss.' I don't know what you're gettin', But I know what's comin' soon, Says I to th' young one. When your father's home this noon.

"Aw, gee! mom, don't tell father I stayed home from my class.' The boy said to me with a look, That'd, melt a heart of glass. 'I've learned more here this mornin', Than I learn on any day. I didn't play hookey from my school To roam the streets and play. I doped my own lil' hook-up And it's workin' at its best. I'll put it up against them all, For it's different from th' rest."

"An', what do you think he was doin'? Mrs. Casey, you couldn't tell. Oh! You think you've heard th' lingo, But can't place it very well. Now listen, how he told it With me standin' o'er his head, Not knowin' just what minute I would send him into bed. 'Mother, I hear news and music, And I make it come and go, 'Tis th' latest of all wonders And it's just called radio.' —Jewell Williams in "The Globe," New York.

RADIO WORLD

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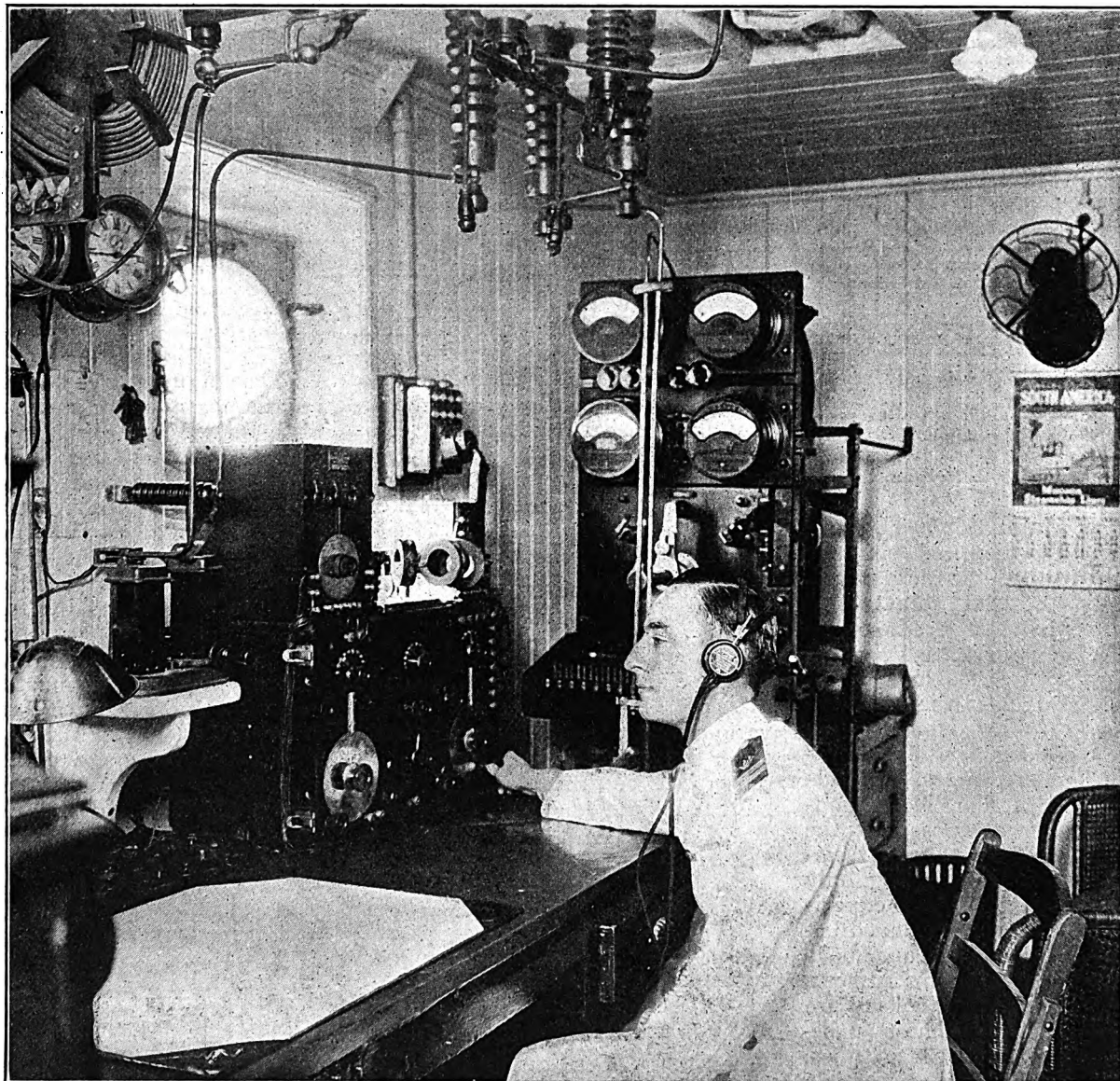
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Vol. 1, No. 25

September 16, 1922

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Powerful Radio Set Kept Secretary Hughes in Touch with Washington



Wireless operating room on the steamship "Pan America," of the Munson Steamship Line, which recently carried Secretary of State Hughes to the Brazilian Centennial Exposition at Rio Janeiro. Chief Operator W. K. Meriweather is photographed at the receiver

THE most powerful radio-receiving outfit ever installed on a merchant vessel is that on the steamship "Pan America," operated for the United States Shipping Board between New York and South American ports. The mechanism was installed for the benefit of Charles E. Hughes, Secretary of State, on his trip to Rio Janeiro as the United States representative to the opening of the Brazilian Centennial Exposition.

The apparatus of the "Pan America" is so powerful that during the entire trip to the Brazilian capital Secretary Hughes was able to keep in touch with official Washington. Communication between Washington and the ship was held through the powerful wireless station at Arlington, Virginia.

Vessels equipped with the vacuum-tube receiving outfit can receive messages up to 4,000 miles, but the set on the "Pan America" was specially de-

veloped by the Bureau of Steam Engineering, Washington, D. C.

The equipment consists of a special radio audio-frequency amplifier, consisting of three stages of radio frequency, a rectifier, and two stages of audio-frequency amplification with a wave-length range from 150 to 30,000 meters. The vacuum tubes used in this amplifier are the Western Electric "peanut" type recently developed for the United States government.

How to Make a Two-Tube Superregenerator

By Frederick J. Rumford, E.E., R.E.

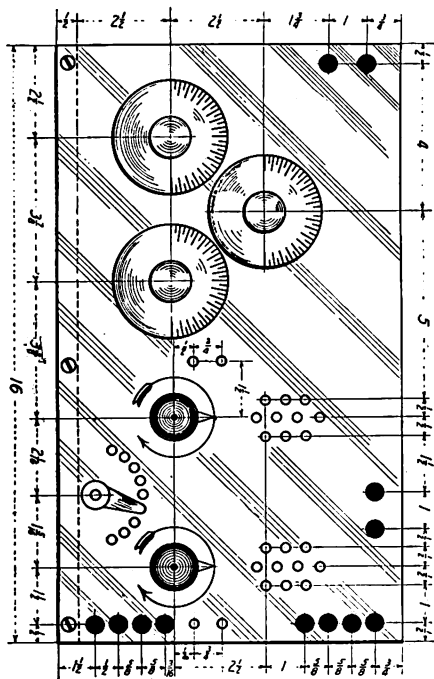


Figure 1—Front view of the set with proper dimensions and correct placing of the various instruments. Suggested by Frederick J. Rumford. Drawn by S. Newman.

WHEN Major Edwin H. Armstrong announced his new invention to the radio world, he certainly "started something," for everyone from the radio engineer to the beginner has been experimenting with Armstrong hook-ups. Being a dyed-in-the-wool experimenter, I followed suit. It is one of the most wonderful radio receptors of modern times. In this article I will describe, in as non-technical manner as possible, the construction of one of Major Armstrong's first hook-ups, using only two vacuum tubes. Most experimenters have become perplexed because of the many and various hook-ups of this particular instrument. The possibilities of this hook-up are wonderful—in fact, almost unbelievable. I have tried three tubes. However, I will confine this article to the two-tube set. The advantages of this set are as follows: It eliminates the necessity of an outdoor antenna and decreases the static and other interferences to a minimum. It also decreases the necessary number of vacuum tubes, two tubes doing the work which formerly took three and four tubes.

I secured excellent results with this outfit, using a loop antenna of ten turns of No. 16 bell wire on a

wooden frame of 40 inches. I heard KDKA, WJZ, and other stations several hundred miles distant. As for the local stations such as WGI, WAAJ, WAUF, Shepards and others, I heard them distinctly in a big room, with a piece of copper-wire screening about a foot square for a loop. Anyone thinking of building this set should study very carefully the different drawings before starting its construction. If the diagram is faithfully followed, the builder should have no trouble in operating it and should get the same satisfactory results.

Figure 1 shows the front view of the set with its proper dimensions, also the placings of the various instruments.

Figure 2 shows the back view of the panel and the method of mounting the vacuum tubes, condensers, vario-coupler and duo-lateral honey-comb coils of which there are two.

Figure 3 shows the proper hook-up for this particular set. This hook-up should be studied very carefully before the internal wiring is done, as it is very easy to make a mistake in wiring this set. If such a mistake should happen, it probably would take a considerable amount of time to discover the trouble.

The symbols on the diagram of Figure 3 are as follows: G, grid; P, plate; F, filament; P, primary of the vario-coupler; S, secondary of the vario-coupler; R, rheostats for the purpose of controlling the filaments of the vacuum tubes; P, phones. In

this particular instance the phones used were of 2,000 ohms resistance; C, a variable condenser of .001 mfd capacity; C1, a variable condenser of .001 mfd. capacity; C2, a fixed condenser of .001 mfd. capacity or a phone condenser; L1, a 1,250-turn duo-lateral honeycomb coil; L2, a 1,500-turn duo-lateral honeycomb coil; 201 are the radiotron vacuum-tubes used in this circuit. A Bat., the usual 6-volt, 80-amperes filament battery; B Bat., a plate battery of 90 volts; B2, are, each, a small flashlight battery of $4\frac{1}{2}$ volts each. These batteries are better known as the biasing batteries.

The parts necessary will cost:

2 radiotron vacuum-tubes UV-201, \$6.50 each	\$13.00
2 vacuum-tube sockets, \$1 each...	2.00
2 rheostats, \$1.50 each.....	3.00
2 variable condensers, .001 mfd., \$4.50 each	9.00
1 vario-coupler complete	6.00
12 binding posts, 10c. each.....	1.20
1 formica panel (16 x 9 x ¼), 3c. per sq. in.	4.32
1 duo-lateral coil, 1,250 turns, about	2.75
1 duo-lateral coil, 1,500 turns, about	3.50
1 switch assembly complete	1.50
1 soft wood base (16 x 11 x ½)....	.50
1 bracket and shelf assembly.....	1.00
Screws and wire and accessories	1.00

\$48.77

These figures are as nearly correct as possible, but there may be a little change in them.

If the builder should desire, he may use, in place of the radiotron vacuum tubes, two Western Electric type L-tubes. Major Armstrong, in his actual experiments, used the Western Electric tubes. In all circumstances the tubes used must be of the hard amplifying type.

First, the builder must take his panel, mark off and drill for all necessary holes. After this is done, he should then give the panel a good rubbing with oil and any No. 0 sandpaper. If he so desires, he may

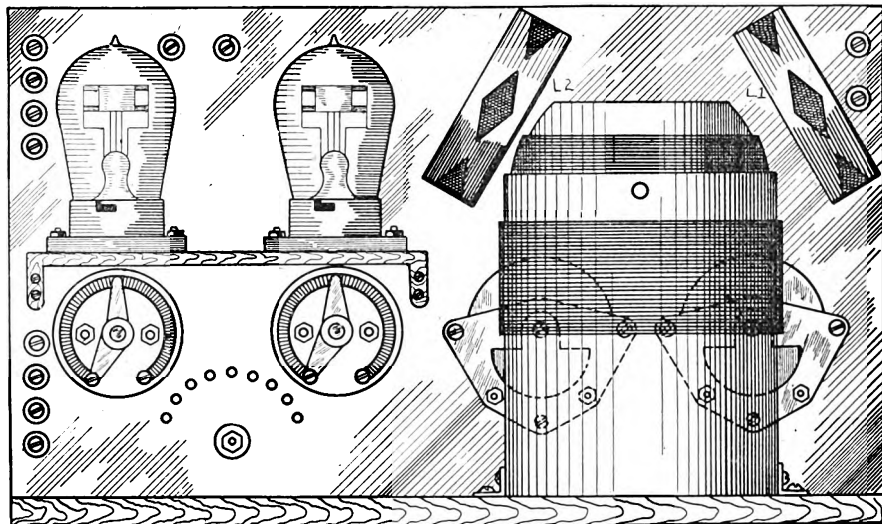


Figure 2—Rear view of the panel, showing the method of mounting the vacuum tubes, vario-coupler, and inductance or honeycomb coils. Suggested by Frederick J. Rumford. Drawn by S. Newman.

(Continued from preceding page)

leave the panel with the finish it had when it was purchased. After this, he is ready to mount the rheostats, switch, assembly, and binding posts. Mount the variable condensers on the back of the panel very carefully. The base is now taken and given a couple of good coats of shellac. After this is dry the panel is placed at one of its long edges and fastened there firmly by means of several brass wood screws. The bracket assembly for the shelf for the vacuum tubes is now ready to be made by means of a plain piece of wood of sufficient size to hold two vacuum-tubes. This, in turn, is fastened on the back of the panel by means of two small angle iron or brass brackets. These brackets are held firmly to the panel by means of four small brass machine-screws with nuts fastened on the back of the panel. After this bracket assembly has been mounted, the vacuum-tube sockets should be mounted upon the bracket assembly proper, we will proceed to mount the different parts and instruments on the base. The vario-coupler is mounted and the fixed phone-condenser is also mounted.

· We will return to the panel. On the back of the panel, there must be mounted—as shown in Figures 2 and 3, the two duo-lateral honey-comb coils, as follows: L1 to the right of the vario-coupler exactly as shown in Figure 2, and L2 to the left of the vario-coupler exactly as shown in Figures 2 and 3. These coils are mounted by means of screws passing through the panel and fastened to the mounting on the coil proper. The reader will note that Figure 3: shows the method of mounting the vario-coupler $4\frac{1}{2}$ inches from the panel on the base. The reason for doing this is that if the vario-coupler should be mounted any nearer it would interfere with the function and the rotation or motion of the two variable condensers which are mounted lower down on the panel, one on each side of the vario-coupler.

The vario-coupler used in this set I described in an article in Radio World, No. 5, dated April 29. The leads from the vario-coupler may have to be lengthened, as will be noted in Figure 1. The contacts connecting the different taps of the vario-coupler were placed between the two rheostats lower down on the panel. The reason for doing this was that there was not sufficient room to place them at the exact front of the vario-coupler. It will be necessary also to withdraw the shaft of the vario-coupler and replace it with a longer one. The vario-coupler is fastened on the base by two little angle-irons with

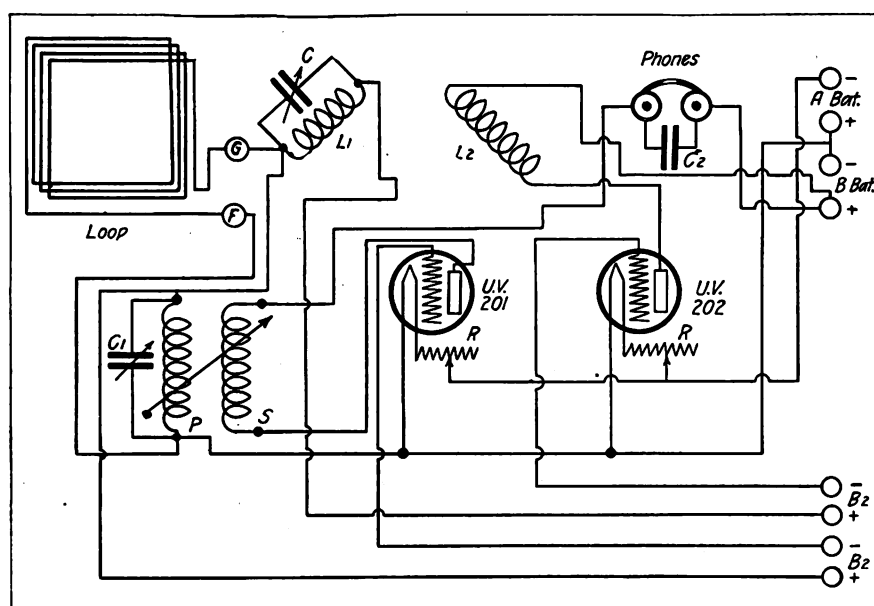


Figure 3—Schematic diagram of the proper hook-up for the set described in this article.
Suggested by Frederick J. Rumford. Drawn by S. Newman.

screws which, in turn, fasten to the vario-coupler form and to the wood base respectively. When this is done, the three-inch dials are then mounted at the front of the panel, one each for the condensers and one for the vario-coupler.

Next, everything must be gone over thoroughly to make sure that the different instruments and parts are in their proper places. When this is done the builder is ready to go on; but he should study the internal wiring-diagram (see Figure 4) thoroughly before he even thinks of starting the wiring of this set, as the least mistake may mean a setback of considerable time to discover the mistake which will be very hard to find in an outfit of this kind.

After this has been done, the internal wiring should follow, with No. 18 or 20 bell wire, rubber covered. A wire will run from the negative side of the A battery, or filament battery, and connect respectively with each of the rheostats which, in turn, connect with one side of each of the two vacuum-tube filaments. There is a short piece of wire used as a jumper wire from the positive of the A battery to the negative of the B battery. From the positive side of the A battery, or from the jumper wire in question, there is a wire which connects with each of the remaining sides of the filaments of the two vacuum tubes and a wire, in turn, connects with the positive side of the first vacuum-tube to the lower connection of the primary of the vario-coupler. There is, also, another wire which connects with the lower side of the primary of the vario-coupler which, in turn, connects with the binding post marked F.

Then the upper connection of the primary of the vario-coupler con-

nects, respectively, as follows: One wire to the positive side of the lower biasing-battery and another wire to one side of the duo-lateral honeycomb coil, L1, which, in turn, connects with the binding post marked G. The remaining side of the duo-lateral coil, L1, is connected to the positive side of the upper biasing-battery. The condenser on the left or the one marked C, is connected across the posts of the duo-lateral coil, L1. This condenser is designated by the letter C. The condenser, C1, is connected across the cario-coupler primary posts. The lower side of the vario-coupler secondary is connected direct with the first vacuum-tubes plate. The upper connections are made to one side of the phones and the other side connects with the positive of the B battery. The phones have a fixed condenser of .001 mfd. capacity shunted across its posts. There is a connection from the duo-lateral honeycomb coil, L2, direct with the plate of the second vacuum tube and the remaining side is connected with the positive side of the B battery. There is a connection from the grid of the first vacuum-tube to the negative side of the lower biasing-battery. There is, also, a connection from the grid of the second vacuum-tube to the negative side of the upper biasing-battery. This completes the internal wiring.

It will be necessary only to connect in the batteries, phones, and the loop antenna for the reception of signals. It will be necessary also to have the coils of the vario-coupler placed in inductive relation to each other, and the manipulation of the various condensers and rheostats for the proper reception of signals. The writer feels sure that if his instructions are carried out faithfully, the builder should have no difficulty in making his set operate.

World-Wide Radio Reports Indicate Great Progress

THE need for radio apparatus in foreign countries, stretching practically around the world, and the advance of this modern phase of communication in both commercial and amateur lines is, perhaps, best recorded in the many radiograms, cables, and letters received by the United States Department of Commerce. A steady stream of communications, informative and interrogative, pours into the department from many government officials stationed in foreign lands where radio is beginning to have a status not unlike its vogue in this country.

Recently considerable interest has been manifest in reports from England, France, Italy, Sweden, Japan, China, India, Mexico and the West Indies. Through all of the communications run indications of further expansion and development in some instances indicating great possibilities for the American radio manufacturers and exporters of radio apparatus and equipment, although foreign-made sets are practically taboo in some countries. American exports in radio are growing constantly, however; an analysis of the June shipments shows that apparatus was shipped to twenty-eight countries and totaled approximately a million pounds in bulk.

England Licenses Receiving Stations

In England the fan is apparently badly handicapped, especially when the regulations are compared to the practice in this country. Amateur licenses for transmitting stations are not granted, but licenses for receiving sets are necessary. The latter are granted only to British subjects for bona fide experimental purposes at a charge of ten shillings for nine months. The postmaster-general has charge of radio licensing and his restrictions and requirements would be considered unnecessarily severe in this country. No boys or girls under twenty-one are permitted to take out licenses to receive, receiving stations must pass inspection, tubes capable of transmitting cannot be used for receiving and special applications certified to by responsible citizens must be filed before licenses are issued. Certain exceptions are made in cases of well-known foreign scientists, but their apparatus will probably be limited in range of reception and restricted to those of British make.

French Radio Weather Service

France is planning a nation-wide system of informing farmers of approaching weather conditions by radio, according to a recent report. Fore-

By Carl H. Butman

casts of the probable atmospheric changes and weather variations for the ensuing eighteen hours will be broadcast three times a day from the Eiffel Tower to communities within a radius of 300 miles. By the use of regional radio stations it is also planned to relay meteorological data. It is also planned to install simple radio receiving sets in designated public or private buildings.

Japanese Radio and Cable Operations

Japan proposes to come to an agreement with the Chinese government in regard to the disposition of the radio stations at Tsingtau and Tsinan and to arrange for the continued operation of the submarine cables between Tsingtau and Sasebo, which were part of the communication system developed and administered by the Germans but taken over by the Japanese during the war.

The proposed changes in operation of cables and radio will be in accordance with the provision of the recent treaty, which covered the restoration of Chinese communications to the Chinese government in a large measure. That government is disposed to cooperate with private foreign capital in the development of the cable and radio systems in China, but the sense of the treaty provision is to prohibit the handling of commercial telegraph business by any means from China through the agencies of foreign governments. The American radio stations at Peking and Shanghai will eventually be closed to commercial traffic, although permitted to handle American and Chinese government messages. Plans are under way for the establishment of a high-power commercial radio station by an American company.

Wireless Telephony for Kobe Harbor

In order to connect the City of Kobe, Japan, with ships by means of the ordinary existing telephone and the wireless apparatus provided on board the large steamers, a company has been formed at Kobe, with a capital of about \$75,000. An exchange office will be established, and it is expected that smaller vessels will be able to enjoy the benefits of this new system as rapidly as they can provide themselves with wireless apparatus.

Mexican Lighthouses to Have Wireless

The installation of small wireless outfits in all lighthouses of the Mexican Department of Communications is reported in the local press. Two sets are being supplied on trial, after which, if they prove satisfactory, all lighthouses

will be similarly equipped, Charge d'Affaires George T. Summerlin, Mexico City, reports.

Radio Advancing in Sweden

Owing to government regulations in Sweden, nothing has been done so far to stimulate popular interest in amateur radiotelephony, according to William L. Peck of the American consulate, Stockholm. The use of radio apparatus is controlled by the Royal Telegraph Board. Private firms may use it under license, but they have not availed themselves of this right.

The single Swedish firm manufacturing radio apparatus and parts has supplied considerable quantities to the Swedish government. The factory is comparatively small, but arrangements have been made for its expansion should circumstances warrant.

The apparatus imported into Sweden is mostly of German make.

Radio Helps Troops in India

The Madras government, India, has just ordered seven radio sets from the Marconi Company of London for use in the Malabar area of the presidency, according to Vice-Consul H. A. Doolittle.

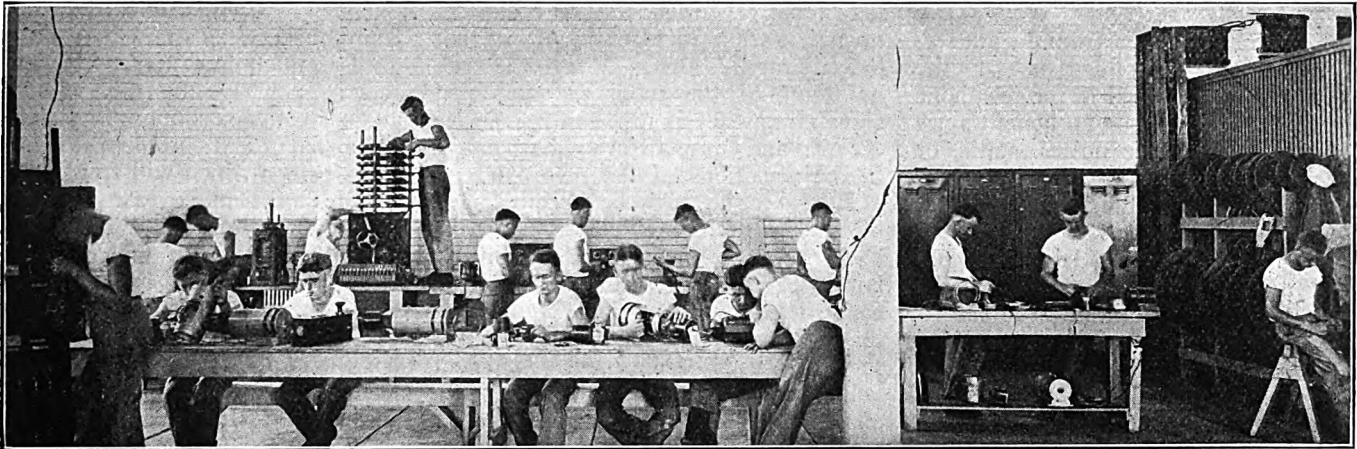
This comes about logically as an outgrowth of the Moplah rebellion in that region, lasting from August to December, 1921, in its main phase. The Malabar section, heavily wooded and hilly, even mountainous, is traversed only by footpaths and a few post roads. The work of the troops was greatly hindered by the destruction of all means of communication, telegraphic and postal, by the rebels, a number of whom were trained soldiers who knew the value of such hampering tactics. When the lines were promptly repaired they were again torn down. No amount of watching prevented their being destroyed by the rebels as fast as repaired.

Six armed camps, constructed at various strategic points, each with a company of police, have been provided with duplex-telephone installation sets. A charging plant is also being imported to be installed under the supervision of one of Marconi's experts. The aerial system employed will consist of two masts 30 feet high, 200 feet apart, made from local material. An effective range, depending on conditions, from 30 to 50 miles, is hoped for; sufficient for communication between the camps.

In an effort to push the employment of stations throughout India, the Marconi Company is arranging for a series of demonstrations among the various native states in the near future.

Aircraft Radiomen in the Making

By Washington R. Service



The United States Navy's Aircraft School of Instruction

WASHINGTON, D. C.—A new type of radio expert has just been designated. "Aircraft Radiomen" are now being developed by the Naval Bureau of Aeronautics at Pensacola, Florida, and the Army Air Service at Rantoul, Illinois.

During the past year, about sixty radio operators for aviation work were trained by the Naval Air Service at Pensacola, and assigned to active flying duty where they are doing excellent work as aerial radio operators.

Promising students in radio are selected from the classes at the Naval Great Lakes Training Station, and transferred to the Aircraft Radio School at the Naval Air Station, Pensacola, Florida. On arrival, these students are put into classes varying from twelve to forty for instruction in ground schoolwork where they learn the same elemental principles of radio and aviation taught to the student aviators under the same instructors.

With the ground work of their aerial and radio education completed, they are sent to the radio laboratory for special communication instruction and practical work in overhauling and testing of different types of radio apparatus. Under the direction of competent instructors, they learn how to "shoot trouble," disassemble, repair and assemble receivers and transmitters, rewind armatures and transformers, and test the finished radio apparatus. Later the students are assigned to radio compass stations for instruction in the use and maintenance of direction finders as well as in the methods of taking bearings. Finally, a week is spent in the radio station for experience and practice in procedure and standing watch. During the last three weeks of the twelve-week instruction course they are assigned to one of the operating air squadrons for practical instruc-

tion and experience in the installation, upkeep and operation of aircraft radio sets in all available types of seaplanes.

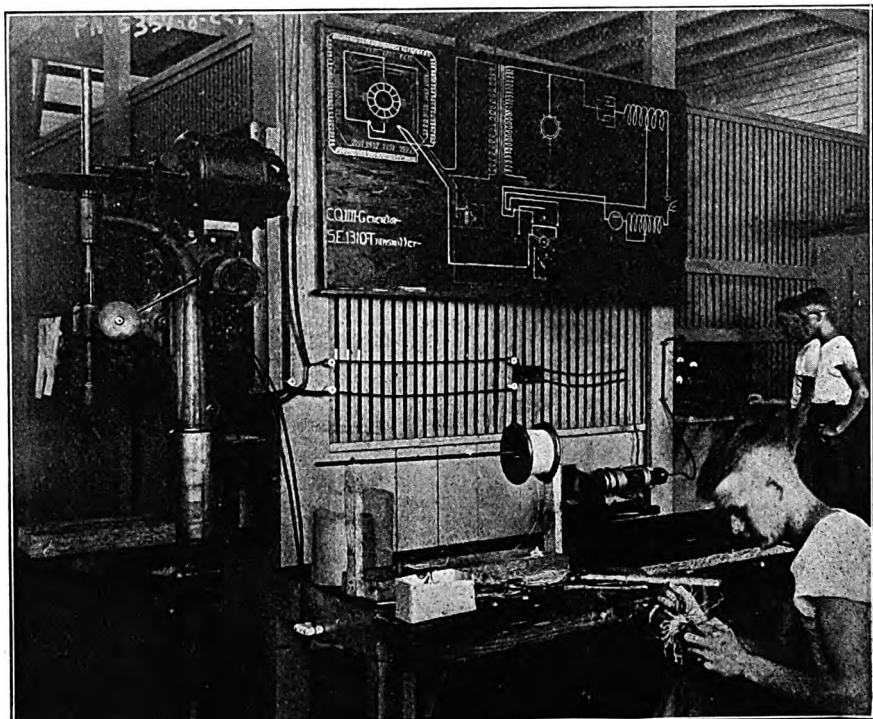
Following twelve weeks of rigid training and instruction, the radioman is ready for transfer to an operating air station, or squadron of airplanes, where he finds that he fits into the scheme of things very handily, although he is a newcomer in naval aviation.

The policy of the school prevents the turning out of a great number of radiomen, it being determined to graduate only as many qualified radiomen suited for aircraft work as possible. For this reason about 37 per cent. of the men reporting for instruction at the station were returned to the general naval service as not qualified for air-

craft radio work before the course is completed, but 63 per cent. have qualified and gone to stations.

The Naval School schedule is as follows:

Week	Subjects Pursued
1	Code, aircraft nomenclature, radio regulations and procedure.
2	Code, theory of transmitter.
3	Code, theory of receiver.
4	Types and uses of aircraft apparatus.
5	Interphones, sizes and types of wire used.
6	Spark transmitter and all aircraft types.
7	Tube transmitter and all aircraft types.
8	Aircraft receivers, all types.
9	Radio compass, taking 100 practice bearings.
10 to 12	Seaplane installation and operations. Practical station work.



Laboratory and Instruments Used in the Study of Applying Radio to Airplanes

Methods of Amplifying Radio Signals

By B. Bradbury, R. E.

WHEN receiving very weak radio signals from distant stations, amplification of the audible tones as heard in the telephone receivers is of little or no benefit since the strength of tube noises, static, or other interference is increased in greater proportion, than the signal strength. Under these conditions, the most satisfactory signals frequently will be obtained directly in the output from the detector without additional amplification, since the signal, although weaker, is much more distinct in the telephones than when amplified.

To secure a louder signal with good quality, or to receive more distant stations, some other means of amplification must be adopted. This other means is the amplification of the signal frequency as it is received on the antenna, before it reaches the detector. Detector efficiency decreases with a decrease in the energy received, so that if we can increase this energy before it reaches the detector, better efficiency will certainly follow.

One of the most common methods of obtaining radio-frequency amplification is the utilization of regeneration in the detector tube itself. Since perfect rectification does not take place in the

detector, a certain amount of radio frequency flows in its plate circuit, so that by coupling this circuit back to the grid, or input of the tube, the amplified signal-frequency is made to reenergize the grid and cause a still greater change in the variations of the plate current.

Regeneration may be accomplished by means of capacitive or inductive back-coupling, or a combination of both. Short wave receivers are often constructed with a variable inductance in the plate circuit which can be tuned to the signal frequency. Sufficient voltage is thus built up across the plate circuit to feed a small amount of energy back to the grid through the capacity between the grid and plate within the tube itself. For long wave-lengths the tube capacity becomes insufficient for good regeneration, and some additional means must be provided, such as inductive coupling between the grid and plate circuits. This consists of placing a coil of wire in the plate circuit and coupling it back to the input or grid circuit of the tube.

Another method of obtaining radio-frequency amplification is to use one or more vacuum tubes ahead of the detector tube with suitable coupling between them to transfer the energy from one tube to the next at the signal fre-

quency. As with audio-frequency, the coupling between tubes may be resistances, inductances or transformers, but they cannot have the same values as in audio-frequency coupling. Just as it is somewhat of a problem to build a transformer which will transfer signal voltages uniformly over a wide range of audio tones, so is it difficult to build transformers which will operate well over a broad range of radio frequencies. Since there is such a great difference in the frequencies of the various wave-lengths in use, it is necessary to change transformers to receive all of the different classes of communication.

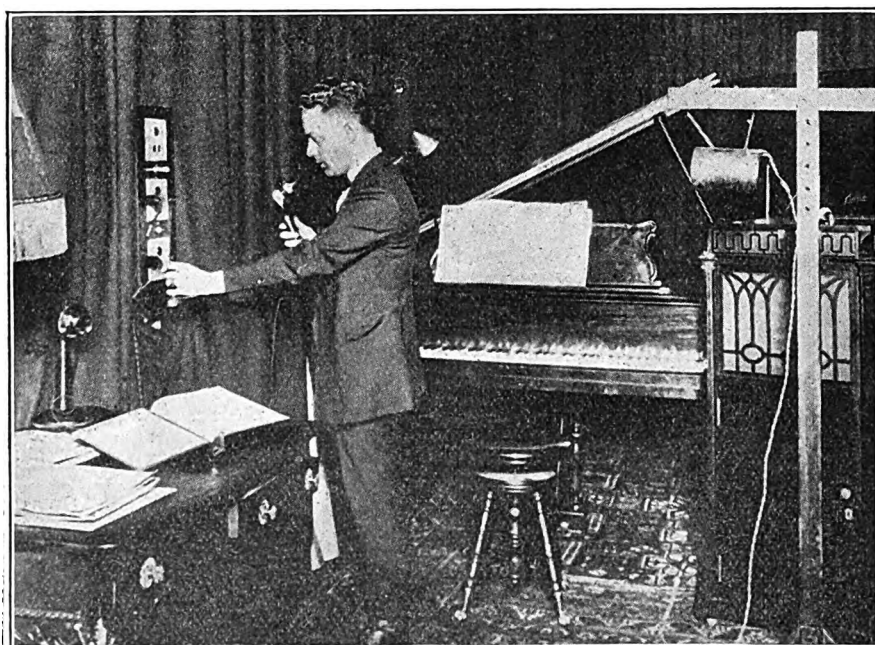
At short wave-lengths, amplification is accompanied by more or less regeneration through the grid and plate capacities of the tubes, as mentioned in connection with detector regeneration. For some wave-lengths the back coupling is sufficient to cause oscillations in the amplifier tubes, and to overcome this tendency some special means must be provided, such as an adjustable grid voltage which may be made positive and thus secure stable operation.

Resistance coupling has the disadvantage of letting through tube noises and other audible frequencies, so that it is sometimes difficult to use it with advantage in addition to the regular audio stages following the detector. It has, however, the advantage of being effective over a wide range of frequencies and therefore, will give uniform amplification over a broader wave-length band than inductive coupling.

Inductive or transformer coupling, as previously mentioned, will transfer energy at a limited range of frequencies. For this reason, inductances and transformers made for use in the amplification of the high frequencies of short wave-lengths will not transfer tube noises or disturbances which are limited to audible frequencies. Several stages may thus be connected in cascade to amplify the signal without distortion before it reaches the detector. Audio amplification may then be added as desired to obtain whatever volume of sound is found necessary.

Three or four stages of radio-frequency amplification make it possible to use a loop antenna with good results. For receiving broadcast signals, a loop made by winding ten turns of wire, spaced three-eighths of an inch apart on a frame three feet square, is about the right size to use. There are transformers on the market which will give good signals in conjunction with a loop and the construction of such a set will produce very gratifying results.

WJZ Announcer in His Specially Equipped Room



(C. Kadel & Herbert News Service.)

Behold! The voice that is familiar to thousands of listeners who tune in for WJZ, Newark, N. J. This is a photograph of Mr. T. H. Cowan, whose pleasing tones daily announce, "the next selection"—in his specially equipped radio room at the popular Westinghouse station. To the right of Mr. Cowan is the transmitter, mounted on its pedestal, through which instrumental music, or the human voice is received, or transmitted, through the powerful tube-transmitter installed in another room of this station.

Voice Distortion in Vacuum-Tube Receivers

By W. A. Dickson

VOICE distortion is encountered by most every experimenter who designs his own receiving apparatus, and although perfect reproduction cannot be made possible with present-day equipment, a great deal of unnecessary distortion may be eliminated by getting down to the fundamental causes and applying the proper remedy. The most common causes may be remedied usually without much difficulty.

Where cascade amplification is employed, it is necessary to have each tube operating on the proper point of its characteristic curve. This part of the curve is usually the flat portion; and to make sure that the tube is operating here, it is necessary to always maintain a sufficiently large negative potential on the grid. This may be accomplished by employing the correct values of filament current and plate voltage. An A battery potentiometer, or a small negative grid battery, provides two sure methods of obtaining the normal grid-potential.

In using a regenerative receiver, distortion is often caused by employing too much regeneration; that is, operating the set above the point where oscillations begin. This causes a mushy reproduction. By sacrificing audibility, distortion may be eliminated greatly.

Another of the most frequent causes of distortion in amplifying circuits is a poorly designed transformer. It may be plainly seen that there is but one remedy for this cause—a correctly designed transformer.

Distortion might be caused by using a plate voltage larger than that for which the tube is designed. A good plan is to use transmitting tubes in place of the ordinary amplifying tubes. This would allow large plate-voltages to be employed without danger of overloading. A greater ratio of amplification may be secured by this plan. It also cuts down the number of stages necessary for the desired volume, as more than two stages of audio-frequency amplification is inadvisable.

Trouble is often encountered with telephone receivers, but it is up to the operator to select a pair that is correctly designed. Where a loud-speaker is employed, using an ordinary receiver attached to a horn, only a certain degree of audibility may be expected. Beyond this, the receiver jams owing to the large amount of current.

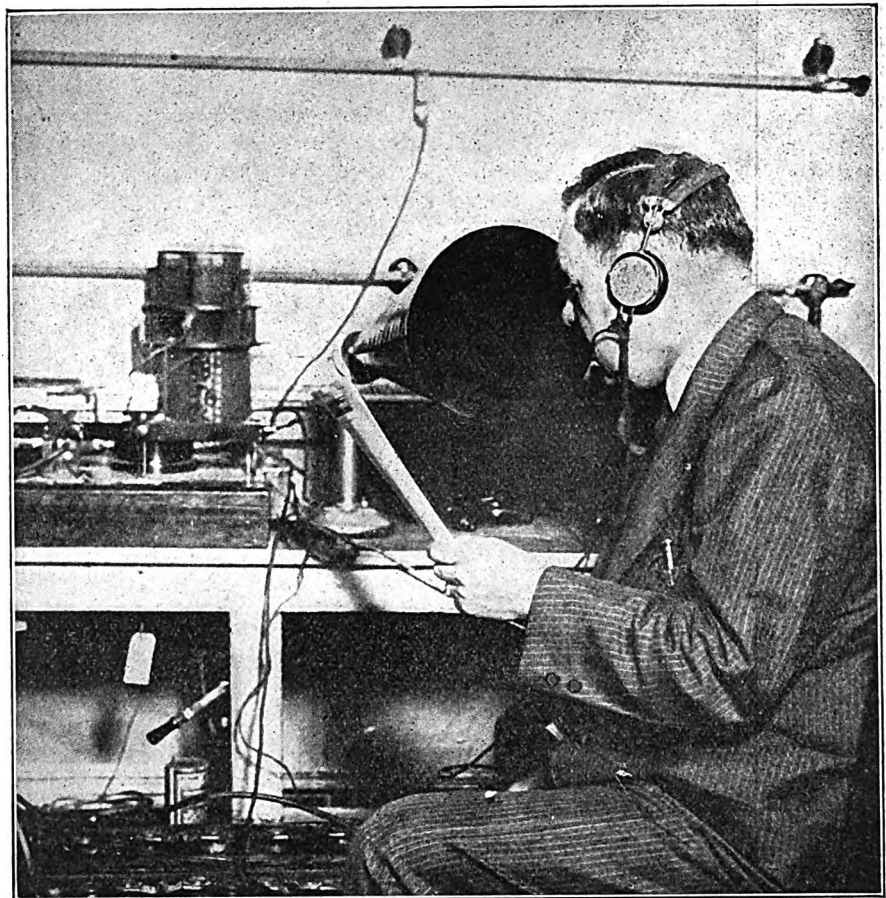
Reproduction from such a type of loud-speaker is inherently prone to cause a certain amount of distortion. This is due to the resonance effects in

the diaphragm or in the horn itself. Where large volume is desired with as little distortion as possible, practically the only method is to use a receiver of the electrodynamic type.

Although not classed exactly under voice distortion, "howling" is equally disastrous to a radiophone receiver. Care must be taken in designing the

receiver and amplifier, to eliminate as much as possible by having the connecting wires running parallel or close to one another. The grid lead to the detector tube is, probably, the most sensitive and should always be as short as possible. In mounting the transformers, place them at right angles to each other. If their magnetic fields are both in the same direction, an undesired feed-back will follow and the result will be a continuous howl.

In Washington, D. C., Stolen Motor-Cars Are Located by Radio



(C. International Newsreel Photo.)

Radio amateurs who have just broken the ice and purchased a radio receiving set do not realize the excitement they have missed during the past two years. No doubt, many of the old-timers who have pushed the old "stone crushers," know the secret which may divulge how some motor-car thieves were apprehended. During the night, while the world is sleeping, a little one-half kilowatt radio-spark set was started up in a room at Police Headquarters, New York, about 8 P.M. pronto. In an hour this "little old set" told more secrets regarding police affairs than any newspaper ever hoped to print. Here is the dope: Every amateur who had a receiving set could "get in," provided he could copy at a speed of ten words a minute. Of course, this was not sufficiently fast for anyone but fast enough to indicate that some code experience is necessary. At first, the motor number is sent, then the make of the car, and, finally, the plate license number. Every amateur within a radius of two hundred miles, who may copy this report, will report it to his nearest police station. Then the fun begins! Every policeman within this circular range has a list of the stolen cars, along with important information regarding other crimes. A net is formed, and at once the net begins to close in. It isn't long before fifty per cent. of the stolen cars are recovered. To-day, this same method of apprehension is in operation in Washington, D. C. The above photograph shows Clifford Grant, chief of detectives, of Washington, D. C., sending, by radio, the report of a stolen car. Instead of using code, he talks clearly and slowly, and every word he utters registers indelibly.

The Radio Primer

A Weekly A. B. C. of Radio for the Beginner, in which Elementary Facts and Principles Are Fully and Tersely Explained and all Words and Terms Used by Amateurs and Experts Defined

The Beginner's Catechism

HOW should a set be tuned that has a loose-coupler and a crystal?

To tune a set that has a loose-coupler as a means of inductance and tuning device, set the coupling as tight as possible, tune in the desired signal with the primary, or outside, inductance, and then tune in with the secondary, or inner, inductance until you have the greatest strength of signals. Now, loosen the coupling between these two inductances until the signals are just audible. Start to retune the set with the primary coil until the strongest signals are obtained at the present setting of the coupling. At the end, tighten coupling gradually until you get maximum clarity. This will give you minimum of QRM, or interference.

* * *

Explain how a regenerative set should be tuned for good signals, using a grid variometer and plate variometer with vario-coupler.

Set the coupling of the vario-coupler at maximum degree; that is, with the primary and secondary as close to each other as possible. Now start tuning with the switch knob on both primary and secondary. Also tune with the grid variometer until the greatest signal-strength is obtained. Turn in plate variometer, which was at zero, until the greatest amount of signal strength is heard without distortion. It will be noticed that when tuning with the grid variometer a loud squeal is heard in phones. It will be noticed that this squeal starts at a very high frequency and as the variometer is turned, it decreases until it reaches an inaudible point. Increase again to a point where it becomes inaudible again. When no signals are heard between the two howls you have touched the point where you should hear the voice or music. It may be all Greek to the

By Edward Linwood

novice, but if a few attempts are made to tune in this manner, its simplicity will be seen. It must be remembered, first, to tune with the grid variometer; next tune with the plate variometer for regeneration. Make sure your tube is burning brightly for it to oscillate.

* * *

What is the principal idea of tuning?

The idea is to get the receiving tuner, or set, in resonance with the transmitting set so that the wave lengths of both stations are the same. For instance, if a certain broadcasting station is emitting a wave length of 360 meters, that station must employ in its circuit a given amount of inductance and capacity. We, therefore, must see that the same amount of capacity and inductance is used in the receiver in order to receive the 360-meter wave length. In order to get these different wave lengths we must employ the method of tuning.

* * *

Is it advisable to attempt to rejuvenate a B battery by opening the case and soaking it with water or vinegar?

No. This may work well with buzzer or bell operation where current or voltage is used intermittently, but in connection with radio, it is out of the question.

* * *

In building a set at home, is it advisable to consider making amplifying transformers?

No; because of the many uncertainties which must enter into such designs. You have no way to know or measure the permeability of iron. You are not certain that the core is correctly proportioned, and the best methods of interconnecting the coils of primary and secondary are always in doubt. The average amateur will have sufficient trouble in maintaining a cas-

cade amplifier-set in perfect operation with purchased transformers, without adding to his woes with poorly assembled, inefficiently designed apparatus.

* * *

What are some types of tuning coils?

Beginning with the simplest and working up to the latest and least used types, they are: single slide, double slide, switch controlled, loose coupler, vario-coupler, variometer, and honey-comb or duo-lateral.

* * *

Describe the single-slide tuning coil?

The single-slide tuning coil is the most elementary type and supplies the least range of selectivity. It consists of a tube with 50 or more turns of closely spaced copper magnet-wire. One end of the coil is connected to aerial and the other end to the ground. The slider—a contact that slides across the surface of the wires on a bare path scraped through the insulation—is connected to the detector and the lower end of the coil. The end which is connected to the ground is also connected to the other side of the detector.

* * *

Explain the audio-frequency transformer and what it does in a radio circuit?

The audio-frequency transformer is simply a small iron-core transformer that has a primary coil and a secondary coil wound on it. As iron tends to choke off the high-frequency currents, the first vacuum tube must be the detector and the succeeding vacuum tubes are the audio-frequency amplifiers. Usually the audio-frequency transformers are connected between the detector-tube, plate side and the grid of the next tube. These can be wired in this manner for any successive stages.

Don'ts for Vacuum-Tube Users

DON'T use excessive plate-voltage on power tubes. Remember that with excessive plate-voltage the life of the tube is shortened.

DON'T expect to get great results if an amplifier tube is used as a detector tube.

DON'T make the fatal error of connecting the plate-battery terminals to the filament terminals of the tube. Look carefully over the connections.

DON'T expect results if a loud-speaker is connected to a crystal set.

DON'T alternate any wiring while filaments of tube are in operation.

A simple error in transferring a connection may prove fatal to your tubes.

DON'T burn out your tube through neglect and then expect your dealer to replace it.

DON'T make your tubes secure in the sockets until you are sure that all rheostats are turned off. Be sure of all connections. Go over your wiring carefully.

DON'T handle vacuum tubes roughly. You are likely to injure the elements contained in the tube.

DON'T apply too much voltage to plates of amplifiers. Usually the manufacturers state the required voltage to be used on the plate.

DON'T forget that vacuum tubes are expensive.

DON'T connect batteries up wrong. It may spell disaster.

DON'T search for the greatest volume of sound. Generally tubes are turned to a greater brilliancy for this. It isn't necessary.

Charging a Battery—from a French Radioist's Point of View

By Marius Thouvais

Honorable Secretary of the French Radio Club de Lologue

MANY amateurs have been hindered in their efforts to produce the 4- or 6-volt current to feed the filament of their receiving tubes. It is well known that primary cells are not suitable for this purpose, the best of this type is the bichromate battery. It is the only one which gives a large enough current to light the filaments brilliantly, but the current thus produced is not in any way sufficiently steady to get good results.

The usual type of receiving bulb takes from $\frac{1}{2}$ to 1 ampere, therefore a Lelanche battery cannot give a sufficiently heavy current.

With either the new Westinghouse detector tube, which requires a potential of but 1.1 volt drawing 0.2 amp. (less than $\frac{1}{4}$ watt) or the new French low consumption tube (4 volts 0.15 to 0.2 amp.) which were recently placed on the market, an attempt may be made with a large Lelanche sack-battery; but here, also, the current is not steady and, therefore, the storage battery is universally adopted as the best solution.

For the amateur who cannot use the lighting supply, there is a choice between two suitable primary charging batteries: The bichromate cell and the "Daniel" Sulphate-of-Copper cell. The former gives a heavy current and can charge up an accumulator in a relatively short time. A 3-cell battery gives 6 volts and will charge up a 4-volt accumulator. If the filaments take 6 volts, a 4 cell bichromate battery giving 8 volts will charge the 6-volt storage battery which is usually adopted with most American tubes. These bichromate batteries were used extensively to charge ignition accumulators before the World War; but today the bichromate is too costly—much more so than sulphate of copper—and they are tedious in the extreme to manage on account of dismantling, amalgamation of the zinc elements with mercury, preparation of solution with warm water, etc.

Sulphite of Copper cells are much more suitable for the purpose that we have in view. The voltage they give is much weaker—about 1 volt per cell instead of 2; and, therefore, twice the number of cells is needed.

That is to say, 6 cells for a 4-volt, and 8 or 9 for a 6-volt accumulator. But the current produced by such cells is quite steady; it is produced for a long period, week after week, without dismantling. It also eliminates the necessity of preparing another new solution. In order to reach a sufficient charging rate, cells large enough must be chosen. Glass jars, 8 inches high by $4\frac{1}{2}$ inches in diameter, with porous pots 8 inches to $8\frac{1}{2}$ inches high by $2\frac{1}{2}$ inches wide, are very suitable. As a steady current is a necessity, it is preferable to put the zinc elements into the porous pots and the copper foil into the outer glass jars, so as to have a lower resistance in the element itself. The copper foil which surrounds the porous pot must be kept as near as possible to it without actually touching. Further, instead of using pure water in the jars, it is well to add a small quantity of salt, as salt water is a better conductor of electricity than any other solution and the current produced is much heavier. It will be useful to verify the density of the salt solution as the same degree must be kept in the complete cell, in the porous pots as well as in the glass jars, in order to prevent any unwarranted current passing from one liquid to another.

When the 6 or 8 elements—according to the desired voltage—are connected up in series and sulphate of copper has been poured into the glass jars, the battery already gives a steady current and the accumulators can be immediately put on charge. The current remains steady as long as there is zinc and sulphate of copper in the cells, and all that is needed is to add sulphate when

the solution which surrounds the copper foil has lost its blue color; also, to replace the zincs where they are eaten away. After some weeks, the density of the solutions will have increased too much. Then it is desirable to remove a little of the concentrated liquid and replace it with a little pure water.

The accumulators remain continuously on charge, day and night. An ammeter (reading 0.1 amp. to 0.3 amp.) will be found very useful to show the amount of current which is passing through the battery. A reliable, accurate, and inexpensive ammeter may be made easily, for a few cents, with a magnetic compass.

First: Take a small piece of dry wood, 6 inches long by 4 inches, fit a terminal at each end and the compass in the center. The greater the diameter of the compass dial the better as "readers" will then be more accurate. Drill two small holes each side of the north-and-south line on the wooden base and pass through them a heavy gauge insulated wire which must make a complete loop around the north-and-south line. Both ends of the wire are then connected to the terminals and the accurate ammeter is ready! However, with this simple device, it is necessary that the north-and-south line of the dial point to the north and the compass box must necessarily be pointed so before trying it.

After the apparatus is jointed and firmly fixed and current passing through the loop of wire causes the needle to deviate, the deviation to some extent is proportional to the intensity of the current. If desired the instrument may be compared with an accurate ammeter and calibrated against it. Inserted in series between the charging battery and the accumulators, it will tell us all we want to know; the charging rate.

A charging set built on the above lines has been in use for over two years at my station, and the Daniel battery gives me all the current I want to feed up either a single audion receiver of a three-stage amplifier. Even on occasions, I have found my accumulators overloaded and have had to switch off my battery.

The Radioman's Love Song

By John Webster

I AM high on the breast of the swelling sea,
And your voice comes from faraway home to me;
It comes clear and true from the weird above—
And you sing of love—you sing of love.

I START—I look! But you are not near!
I wonder—I ask: Is it you I hear?
Yes—'tis you!—though your voice comes o'er leagues of sea—
For you sing to me—you sing to me!

Working Diagrams for Beginners

By Fred. Chas. Ehler

(See hook-ups on front cover of this number)

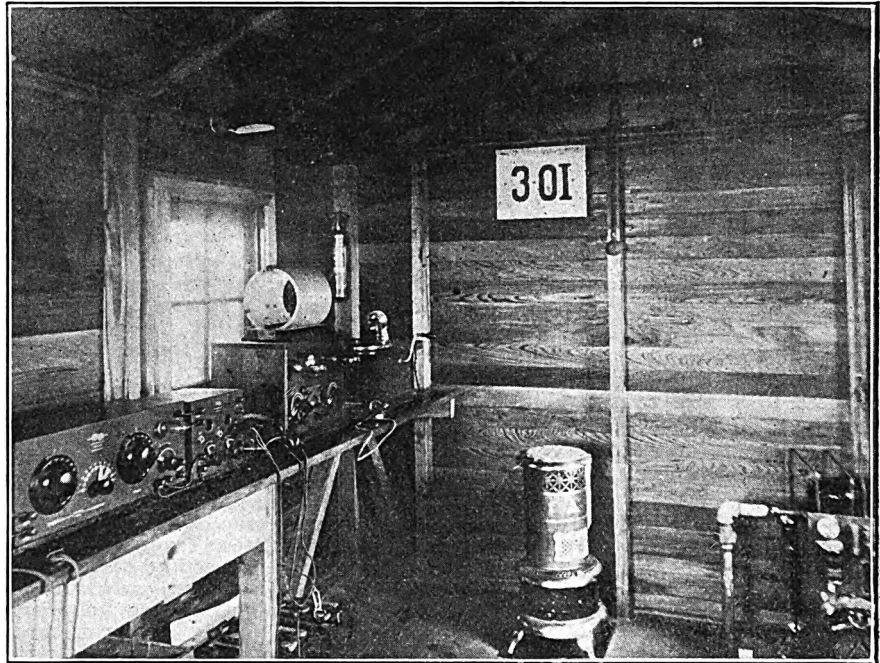
THOSE "wireless hounds" who hark back to the early days when —QSA— was merely three letters of the alphabet know that a regenerative set was seldom spoken of. In fact, the only standby in those days was the type of tuning coil which carried one or two sliders and its crystal detector. Crystal detectors were of the carborundum, or galena type, each operator carrying his own little piece of material which he would not sell "for all the gold in the world." Great changes have taken place since then in the development of the vacuum tube and the regenerative set. The regenerative set I shall describe in this article shows two circuits helpful to any amateur interested in regeneration. It must be understood that these circuits apply only to sets employing the vacuum tube as means of detection, as regeneration can only be used with vacuum types. Crystals cannot be used with regenerative sets.

The simple regenerative-set illustrated consists of a single coil, a variable condenser, a fixed phone-condenser, V-T detector and its batteries. The tickler coil, which is also shown, should be placed in an inductive relation to the single coil. If it is the desire of the operator to add one or more stages of amplification, the primary of the amplifying transformer should be connected at the two points of the telephones and the phones placed in the same position *after* the next tube.

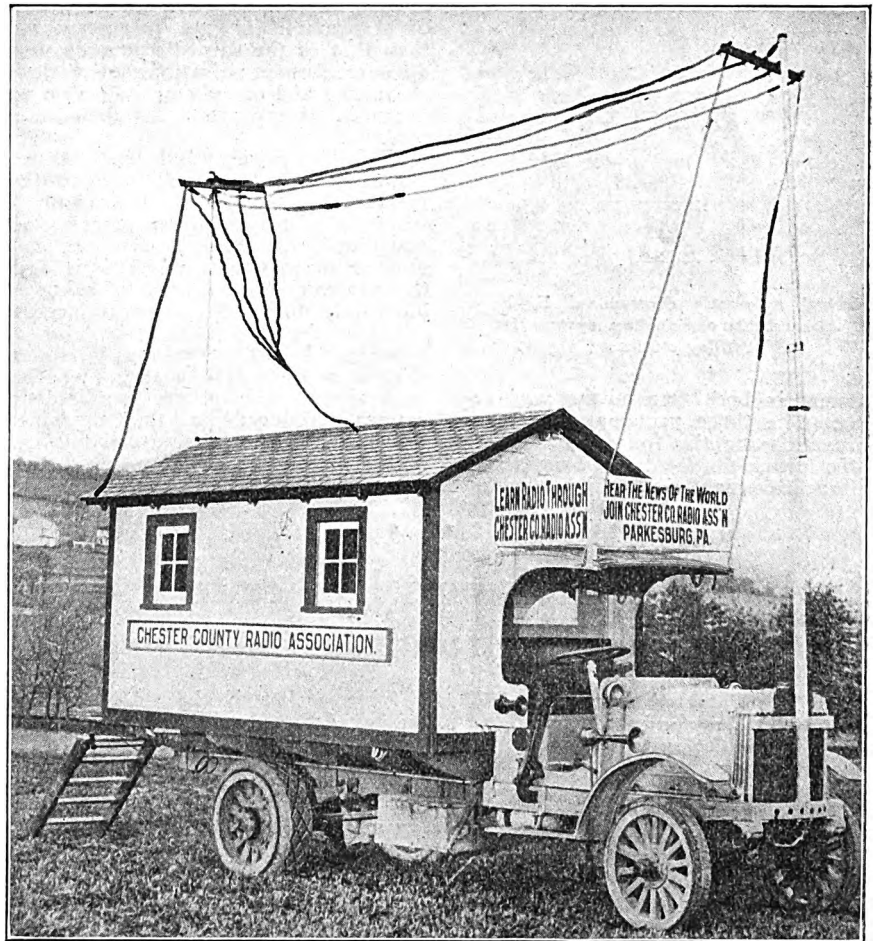
A second hook-up is shown in which the tickler coil is placed in inductive relation. It shows also how the magnetic waves cut the primary coil and the tickler coil. An ideal antenna for either of these hook-ups—for the reception of music from broadcasting stations operating on 360 meters—should consist of a single-aerial, copper wire, about 100 feet in length. The ground connection being made to the cold water pipes or radiator.

In adjusting the receiver the radio fan should tune his set and adjust the feed-back, or "tickler coil," at the same time. When the desired signals are heard, the tuner should be carefully adjusted for maximum signal strength, and the "tickler coil" should be carefully brought up to the point below where "howling" occurs. If the howling starts, the tickler should be reduced rapidly to a position below the critical point.

Radio Station Travels from Town to Town



(Both photographs C. Kadel & Herbert News Service.)



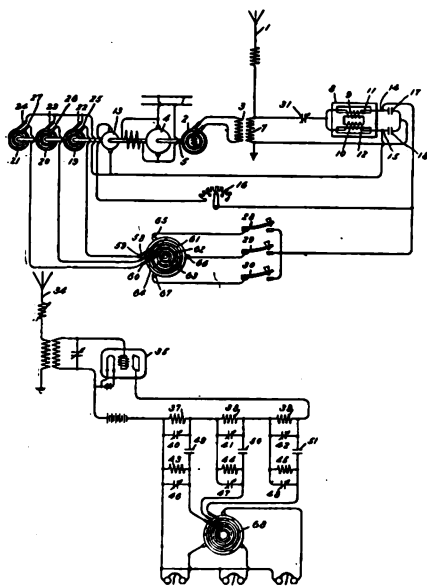
This is the first traveling and receiving broadcasting station in the world. It makes daily trips through rural and suburban districts of Pennsylvania in order that remote dwellers may hear what the broadcasters are sending out, and to transmit any important messages. This station was built by Horace A. Beale, of Parkersburg, Pennsylvania. It is one of the up-to-date radio "stunts" of the Chelsea Chester County Radio Association, one of the most ambitious radio clubs in the United States. The upper picture shows the interior of the traveling station; the lower, its exterior with aials.

Radio Patents

E. F. W. Alexanderson Invents New Signaling System That Will Defy Interference

No. 1,426,944. Patented August 22, 1922.
Patentee: Ernst F. W. Alexanderson,
Schenectady, N. Y.

ERNEST F. W. ALEXANDERSON, inventor of the Alexanderson high frequency alternator—one of the most effective devices used in long-distance radio transmission—has been granted letters patent on a new device by which he expects to secure considerable im-



Principal schematic diagram of E. F. W. Alexanderson's signaling system for baffling static.

provement in both transmitting and receiving. The three principal objects of his invention are the following:

1.—To provide a system of multiplex signaling in which a plurality of mes-

sages may be transmitted and received simultaneously by the use of a single wave length.

2.—To provide a system for transmitting and receiving messages which is arranged in such a way that it will be practically impossible for another station to interfere with the efficient transmission and reception of the desired messages.

3.—To provide a system whereby messages may be transmitted between two stations in such a way that it will not be possible for a third station to receive them.

"In attaining the above objects," Mr. Alexanderson states, "I employ, for transmitting purposes, a source of continuous radio-frequency current, such, for example, as a high-frequency alternator, an arc generator or an electron discharge oscillator. I control the current in the antenna which is supplied by this source by means of a magnetic amplifier of the general type. By varying the controlling current supplied to the windings of this amplifier at a frequency lower than that of the source of supply, I produce amplitude pulsations of a desired frequency and of substantially sine wave form in the current supplied to the antenna."

"If it is merely desired to transmit simultaneously a plurality of different messages, I supply to the controlling windings of the amplifier currents of as many different lower frequencies as the number of messages which it is desired to transmit, these currents being supplied only during the intervals necessary to form the dots and dashes for each message. It will, of course, be apparent that in case several messages are being sent simultaneously, the amplitude pulsations produced in the fundamental wave will be the resultant or combination of the amplitude pulsations produced by several different frequencies employed."

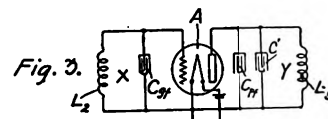
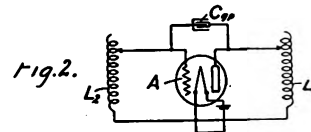
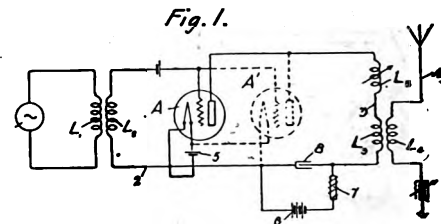
Raymond A. Heising's Device to Prevent Amplifiers from Oscillating

No. 1,426,733. Patented August 22, 1922.
Patentee: Raymond A. Heising,
East Orange, N. J.

MR. HEISING'S invention relates to thermionic amplifiers or repeaters, and its object is to provide simple methods and means whereby a thermionic tube, or audion, used to amplify alternating current, and particularly high-frequency alternating current, can be kept from oscillating with a period, or periods, of its own, owing to the capacity coupling between the grid and the plate or other elements of the tube. In case a tube so tends to oscillate, and its ratio of amplification is sufficiently high, its own oscillations may be magnified to such a high degree as to interfere with the am-

plifying action of the tube or produce undesired frequencies in the output. In general, then, the object of the invention is to so proportion the parts of an inherently coupled amplifier circuit as to prevent it from oscillating.

When an amplifier tends to set up oscillations due to its inherent coupling, it has been found that this action can ordinarily be prevented by properly proportioning the parts of the circuit. In the case of a tube having an inductive input circuit and an output circuit, oscillations due to grid-plate coupling can be prevented by making the output circuit inductance of sufficiently large value. The value necessary will in general depend on certain constants of the circuit,



Three diagrams of R. A. Heising's device to prevent oscillation.

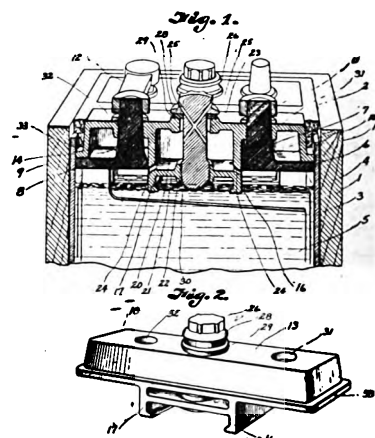
for instance, the internal impedance, the capacity between grid and plate, the input and output coil resistances and the effective inductance of the input circuit. The proper value of inductance in the output circuit necessary to accomplish the object stated, may be determined either experimentally or by calculation. If the coil resistances are negligible, the effective output inductance must bear the same, or a greater ratio, to the effective input inductance as the ratio of amplification in order to prevent oscillation.

* * *

Cell Covers for Batteries

No. 1,419,208. Patented June 13, 1922.
Patentee: Earle A. Berry,
Kansas City, Mo.

THE principal object of Mr. Berry's invention is to provide a combined cell cover, filler tube, gas relief means and separator guard for storage batteries,



Diagrams of the Earle A. Berry battery covers.

which may be inexpensively constructed, conveniently applied and which will possess certain inherent advantages over known types of storage battery cell covers.

52 Weeks for \$6.00
Complete Your File of RADIO WORLD
Copies of Radio World No. 1

Radio and the Woman

By
Crystal D. Tector

AS a result of arrangements just completed with one of the leading caterers in Cincinnati, WLW, Cincinnati, will start transmitting daily menus for the benefit of the thousands of housewives who often are perplexed as to what to have for lunch and dinner. These will be broadcast at or about ten o'clock every morning. There will be two menus for each meal, one for the middle class of people and one for the wealthy class. When special dishes are suggested recipes will be announced. I understand that this very interesting-to-women broadcasting will begin this week.

I am overjoyed to hear that we may have Mary Garden as a radio singer. I understand that this remarkable soprano is more than anxious to sing over the ether waves. She wants to go on record as the first of the great prima donnas to sing through radio.

Friend Husband has asked me to deny that I am the boss of this radio household. So many letters come to us with just a hint that, because of my writings, I must "wear the pants," so to speak. Well, radio friends, there is nothing in that. We are just a normal American couple, and F. H. gives me my own way in all things that tend to make our home more happy. I started out to be a magazine writer, but radio appealed to me more strongly. So I just drifted into it—and I am not sorry.

F. H. is no more the boss than I am. We are both bossing this particular household, jointly, and we are doing it pretty well.

Because I am interested in radio, he is interested too—and we work at radio and study radio together. Just now we are deeply interested in the Armstrong super-regenerator—reading everything we can lay hands on and testing out every hook-up.

We are also interested in motor-car radio transmission. F. H. anticipates a fat fee before Thanksgiving. Then we will buy a car—and the first thing we do with it will be the installing of a radio set.

I am told that at Newport, this summer, a radio luncheon—the hostess was one of our most prominent belles—more than won the attention of a young Englishman who is touring

"the States." Unfortunately for him, he knew little or nothing about radio, being one of those chaps to whom life has been but a bed of roses and work a mystery.

The repast having reached the coffee-and-cigarettes stage, the hostess went to her set and "tuned in." There were a few sounds that reminded one of the interior of an African jungle; but the fair hostess so manipulated the dial that, in a few moments, the unpleasant sounds turned to beautiful music.

The young Englishman listened with appreciative countenance, and was soon asking many questions about the new wonder. In their enthusiasm, the young damsels present told him that radio would perform many things—too many, in fact, to be consistent with their veracity.

Finally one beautiful blonde from Philadelphia turned to him and asked:

"What would you prefer to have next?"

"Some juggling," replied the baffled Britisher.

One of my correspondents writes me that she must send her relations in faraway India a Christmas gift, and she has decided on "something radio," as she describes it. She asks my advice as to what she should send. Her request is a bit puzzling; but I am answering her here, for there may be others in the same fix.

I would go to some good radio dealer and purchase a first-class outfit. I wouldn't go in for the most expensive, but would try and pick something substantial and effective. Next I would get a good book describing just how aials and all should be put in place. Thirdly—and finally—I would subscribe to RADIO WORLD for one year for my relations in India. I do not suggest this because I am connected with RADIO WORLD, but I consider that reading regularly such a publication is more than necessary to anyone just beginning to take an interest in the new science.

There seems to be a great deal of mystery about radio, but it is just as simple as it is interesting when once you get into it. Women come to me—and write me—as if I had solved some terrible problem, because I have become a fan. They "just can't see how I do it." But I tell them that many youngsters know more about it than I. Why, I have a friend whose ten-year-old daughter can operate a set as nimbly as any amateurs I have met. I tell my mystified inquirers that it is the simplicity of radio that is making it popular—and especially with women.

Late Radio News!

Supreme Court Justice Arthur S. Tompkins of Rockland County adjourned court last Friday by a radio message from a westbound steamship. Justice Tompkins, who is Grand Master of Masonic Lodges of New York State, was en route back from Europe. He was to have convened court at Nyack at 10 o'clock the following morning. Miss Natalie Couch of Nyack, court secretary, received a radio message from the Judge at sea advising her that he had adjourned the session to 11:30 o'clock Saturday morning, as the steamer he is returning upon would not dock in New York until 9 o'clock.

Lee de Forest is expected from Europe shortly to give demonstrations of his new phonofilm.

Radio messages received at Nome, Alaska, announce that Captain Amundsen is leaving for the Arctic, where he hopes to drift past the North Pole.

The world's record for a wedding audience is held by Mr. and Mrs. John H. Collier of Washington, D. C., whose matrimonial vows added to the program enjoyed by all radio fans within range. The strains of the Lohengrin wedding march, floating from the organ of the Church of the Covenant, were heard, and the radio listeners then wondered if it was the real thing and were not disappointed to hear the entire

ceremony, with the responses of the bride and bridegroom, through a broadcasting apparatus near the pulpit.

Radio and the Theater

THE theater is an established institution. Radio is an institution in the making. One can help the other. The theater can supply the broadcasting stations with talent, says "The Mail," New York, and in turn the broadcasting stations can help to popularize and advertise the theaters and their shows. Radio helped materially to make Ed Wynn's show, "The Perfect Fool," after it had run its span. People who heard it over the radio were impressed with Wynn's humor, and human-like, they wanted to see the man in the flesh. As a result of this curiosity on their part the sale of tickets for the show shot ahead at a lively rate, and the engagement was undoubtedly extended longer than it would have been otherwise.

When we hear a phonograph record that interests us we always enjoy listening to the singer, player or humorist, or whoever the performer may be, in person, and if they happen to visit our neighborhood theater or we see them billed downtown we try to get there. The same will hold true of radio, but it is going to be a hard matter to prove this to the theater owners.

If the theatrical interests openly declare war on radio they are going to find them-

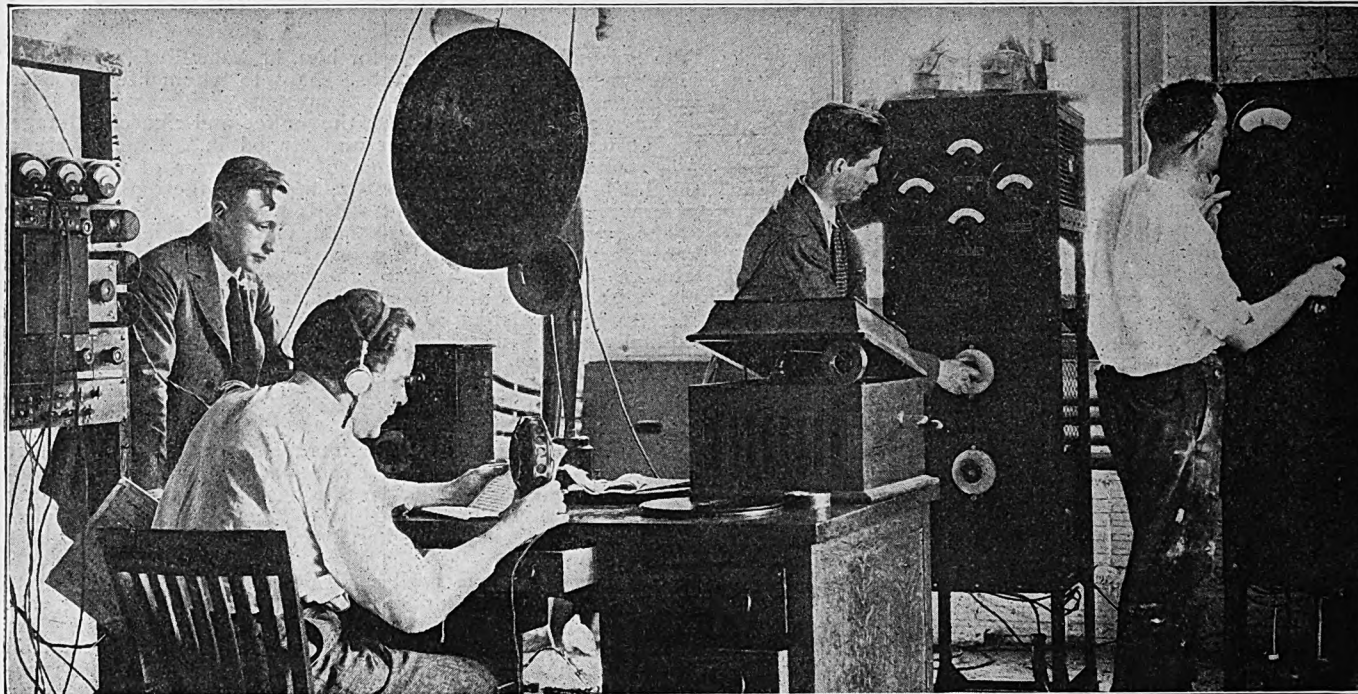
selves pitted against a mighty foe. They would do well to think twice before taking any drastic action. Radio can do more harm to the theaters than the theaters can ever do to radio. On the other hand, each can help the other if sensible co-operation supplants ridiculous and futile opposition. The theatrical interests should have perceived by this time that radio is rapidly becoming the ear of this country.

A Radio Christmas

THE coming holiday season will be known as the Radio Christmas confidently predicts a large manufacturer of apparatus, and there is little likelihood of any informed person disagreeing with him. Not only will the vogue of radio by December be greater than at any previous time, says "The Globe," New York, but radio sets and parts will be the feature of the gift-counters.

Several interesting projects are now being worked out to make attractive packages of radio sets or accessories to sell at varying prices. One that we saw contained all the parts necessary for a complete tube receiver, except the bulb, batteries and head-phone, to sell at a price slightly under \$15. There will undoubtedly be joy in the heart of many an American boy when he receives this sort of present on next Christmas morning.

Broadcasting Room of the Rochester University's \$5,000,000 Theatre

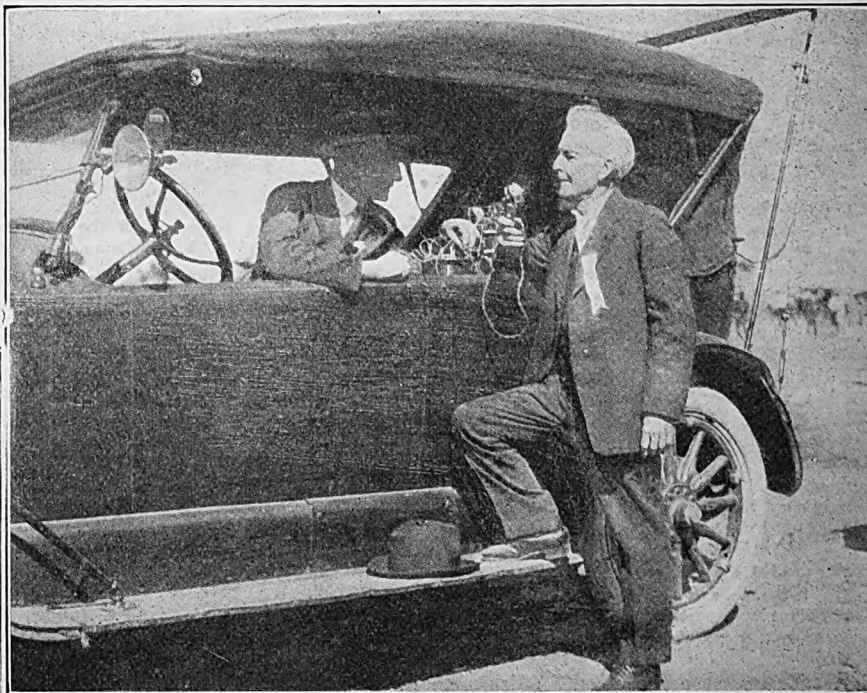


Radio room for both broadcasting and reception—in the new Eastman Theatre, built for the University of Rochester, New York, by George Eastman, millionaire camera manufacturer, at a cost of \$5,000,000. It is the first university-owned and operated theatre in the United States, and will soon be open as a unit of the Eastman School of Music of the university. The theatre is the last word in construction, convenience, architecture, and decoration. It has a seating capacity of 3,400. But our interest is largely confined to the radio department. The photograph gives an excellent view of the fine working outfit. It is Mr. Eastman's wish and the university's intention that both the School of Music and the broadcasting department shall benefit the public at large. With this in view, the musical programs will be broadcast free of charge.

First Motor-Car Broadcaster

A development that has placed radio in the front rank of service is the transmitter erected on a motor-car. Here is the reality—and it works successfully. This traveling station was devised and constructed by Mr. Nils E. Borch, of Oakland, California. Mr. Borch is photographed (at right) seated in the car, making adjustments on the transmitter. Luther Burbank, the horticultural wizard, is delivering his first radio address through Mr. Borch's portable broadcasting station. The aerials are erected atop the car. Practical use is being made of this broadcaster.

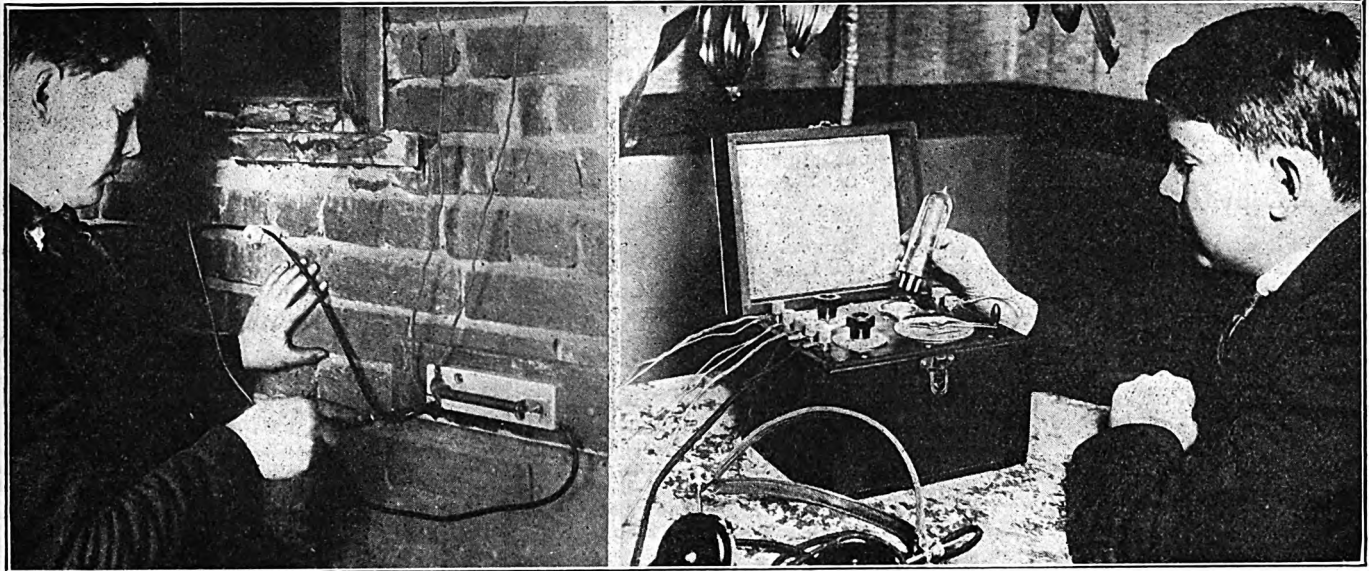
(C. International News Reel.)



Boy Scouts Learn Radio

The illustration at the left shows the radio station of the Chicago Boy Scouts at White Bear Lake, Michigan. The set is a two-stage regenerative amplifier, utilizing honeycomb coils. The boys like their radio work, and await keenly the news and musical concerts sent out nightly from the broadcasting stations in Chicago. Their radio studies are intensely interesting. The Scouts are taught Continental Code and both transmitting and receiving, as well as the construction of hook-ups.

The Correct Way to Attach Your Antenna to Your House



(Three photographs C. Kadel & Herbert News Photos.)

THE insulated wire coming through the insulating entrance bushing in the window is shown in the upper left-hand photograph, attached to the single end of the protective device. A protective device is of vital importance and is required by the Board of Underwriters.

The protective device contains a fuse which will blow out and break the connection if a live electric wire happens to come in contact with the antenna wire. It will also divert lightning to the ground connection. Many sets have been installed without a safety device or switch. Any reliable dealer in radio sets will recommend the types of devices accepted by the underwriters. This is important; otherwise, in case of fire, it may be difficult to collect on your fire-insurance.

Similar ground connections are made for the wire telephone and telegraph. The hazards are no greater for the radiotelephone. The heavy insulated wire, running to the left in this illustration, is the ground wire and the two small wires lead to the receiving set. The small wire connected to the same point as the ground wire leads to the ground post on the receiving set, while the small wire connected to the other terminal on the protective device, leads to the antenna post on the receiving set.



The upper right-hand photograph illustrates the inserting of type W-D 11 aeriotion tube into holes in the base that receives prongs on the tube. Be sure prongs register with holes and then press in firmly.

The boy in the photograph at the lower left-hand is fastening the "dead" wire. The wire may be considered dead, as it only supports the antenna wire. The insulator prevents electricity from running from a conductor, such as a lightning rod or live wire, on to the antenna.

The antenna wire is shown in the boy's left hand. The section running to the loop will be stretched through the air, without any interference from the house to a building, or tree, nearby. The wire running towards the ground, shown at the boy's third finger, leads into the house. The wire should be the same size as the antenna wire but insulated.

The boy at the extreme right is shown stretching the antenna wire through an insulator. The "dead" wire, attached to the building, should be at least 10 feet long. That is, the antenna wire ought to be at least 10 feet clear of all obstacles. When the connection is made to a tree, the antenna should be at least 10 feet clear of all limbs and branches. You will find this of vital importance when the sap is up and in case of lightning striking the tree.

The length of a single-strand antenna should be at least 100 feet long—the longer the better—stretched, not too lightly, from 25 to 50 feet above the ground. Single-wire antennas give the best results. A two- or three- or four-wire antenna is used only when the space available is insufficient for the long single-wire. You will find many radio enthusiasts who will tell you that these requirements are not necessary. However, those who are getting the best results in long-distance reception are following these practices.

Sometimes it is satisfying to know just what type aerial to erect. Some amateurs erect the inverted L-type while others take it off in the center making a T-type. All of these aeriols have specific calculations when one is figuring wave length. Radio experts claim that capacity times inductance gives us wave length; so, therefore, it can be seen that with the T-type aerial we would have less wave length than the inverted L for the simple reason that with the inverted L the lead-in is taken off at the end allowing for the total wire to be figured in when calculating wave length. With the T-type aerial, the lead-in, which is taken off at the center, reduces the wave length one-half. That is to say: if with an aerial 100 feet long, the T type would have a



wave length of 200 meters and the inverted L would have 400 meters wave-length.

When erecting an inverted L, it is necessary to make the lead-in fast on the end pointing toward the station you wish to head. In the lower photograph, the aerial is of the inverted L-type. The direction of the loudest signals heard would be from the distance from the left of the insulator.

Aerials are half the radio battle provided they are erected properly. Too much cannot be learned about aeriols. Proper insulation is another big factor for without perfect insulation most of our signal strength would be lost to ground. With good insulation provided for one should be able to get the best results, as all of the energy that can be absorbed will be sent to the receiver for rectification. Always remember that a good aerial with good insulation will give satisfactory results.

Radiograms

Latest Important News of Radio Garnered from the World Over, and Reduced to Short Wave-Lengths for the Busy Reader.

HERE is a radio fan who offers a reward for "air hogs." James S. Bryan, attorney, and radio fan, of Rochester, New York, has offered \$10 reward for information that will lead him to broadcasters near his home, who, he says, are "hogging" the air. Mr. Bryan says every night as he adjusts his apparatus to listen in, the amateurs begin broadcasting in code and interrupt him. Recently, he asserted, it has become so annoying that he is contemplating complaining to the radio officials at Detroit.

* * *

Radio is increasing in popularity. A survey completed by the National Radio Chamber of Commerce, on June 1, showed approximately 1,500,000 receiving sets in the United States. It is estimated that there will be 5,000,000 more within the next five years, equal to the number of phonographs in use to-day.

* * *

Dr. H. W. Nichols, an eminent electrical engineer, announces that the ether is not only not of use in radio transmission, but it is an interference. Dr. Nichols believes that much can be done to remedy the static disturbance by a means of sharper tuning.

* * *

The British are solving their radiophone broadcasting problems by floating a company composed of representatives of all the manufacturers of radio equipment to finance the scheme. Eight stations will be permitted by the Government, and they will be erected in certain selected areas. The Government will contribute partly to the expense of maintaining and operating these stations out of the license fees it receives from owners of receiving equipment. The manufacturers are to be given two years of outright protection against foreign equipment under the scheme.

* * *

A "dead" spot in the atmosphere which cannot be penetrated by radio has been discovered in Southern California. Amateurs have been perplexed about it for some time and they have come to the conclusion that there is some barrier to the waves that they cannot understand. An aviator undertook to fly through it a few weeks ago, and his machine became so unmanageable that it fell to the ground. He said that "the air just gave out."

* * *

The widespread extension of the use of the radio telephone is beginning to affect the mining industry in certain quarters of the country to such a degree that the supplying of crystals of certain ores has become a small industry in itself.

* * *

Radio waves may replace guns in the next "world war" if the present advance in radio science continues, according to opinion expressed by Professor A. M. Low, British scientist and inventor of the British wireless-controlled airplane and torpedo. The old-fashioned battle with infantry, cavalry, and artillery, fighting with the bayonet, the saber and gunpowder is a thing of the past. The weapons of the future are the airplane, the wireless, and the poison gas wave. Aerial electrical battles may turn the tide of future wars, Professor Low believes.

* * *

It is disappointing to learn that Italy is the most backward country in radio, notwithstanding the fact that it is the birthplace of the great Marconi. Commander Tosi, former navy officer and inventor of various radio appliances claims that this is due to the opposition of every ministry of the past twenty years. Says Commander Tosi: "It was twenty years ago that Senator Marconi sent a letter to a member of the government in which he outlined his wonderful scheme for making Italy the most perfectly equipped nation so far as wireless was concerned. He waited many weeks for an answer to his proposal. After some time, he received back his letter, in which he had given detailed notes of what equipment staff, and land reservations would be needed, and on the margin was written, in the minister's handwriting: 'I consider Signor Marconi a fit subject for an insane asylum.'"

* * *

The American Society of Composers, Authors and Publishers has issued an ultimatum to the Westinghouse Electric Company, General Electric, Radio Corporation of America, American Telegraph and Telephone Company and the National Radio Chamber of Commerce that on and after September 10 the society will bring suit in the Federal Court against any and all radio stations that broadcast copyrighted music on the premise that it comprises an infringement of the copyright law

as regards the public performance of copyrighted music for profit, without license. These companies, as well as the Secretary of Commerce and the Authors' League have been notified to attend a conference at the society's rooms September 20 for the purpose of formulating a plan whereby the copyright owners of popular and standard music may be reimbursed for the use of their catalogues.

* * *

Keep a sharp look-out for the man or woman selling fake radio stocks! A recent prospectus was so worded that it guaranteed, beyond all doubt, a return of \$100,000 on an investment of \$500 within six months. Such a promise should make anyone say, "No!" as if spoken through a loud-speaker. Anything offering more than 6 per cent. on the investment calls for the most careful investigation. The radio business must not be "Ponziized."

* * *

Visions of the radio future! Major E. H. Armstrong announces that he can make his radio signals ten thousand times shorter by making simple additions and rearranging the wires. General Electric has made a new tube that will replace the large alternators now used in long-distance sending. A new wire antenna is soon to be perfected. Marconi predicts a future for short waves.

* * *

The proficiency of Naval radio operators was established when a competitive radio drill was held among the destroyers of the Pacific fleet. Of the seventy-three ships represented, six squadrons secured 100 per cent., and one 99 per cent. Not one had a record below 83 per cent.

* * *

The Tropical Radio Telegraph Company is erecting in Tegucigalpa, Honduras, one of the most powerful tube-transmitting stations on the Western Hemisphere. It is expected that it will be in operation by December.

* * *

Evidently the lure of radio is stronger than the lure of scenery. The old-style railroad advertisement, featuring the beauties of the scenery through which the trains passed, has been supplanted by announcements that radio-telephone broadcasting concerts may be heard aboard the Buffalo Limited and the New York Limited.

* * *

The ten-day journey by stage coach made by Mark Twain over the Utah desert, in 1862, is now made in less than ten minutes. This is due to the radio-equipped airplanes of the United States Air Mail Service. This service has carried the mail from San Francisco to New York City in thirty-six hours. At 12 midnight, on July 16, last, it completed a year of daily service without a single fatal accident. During this time, planes flying over the New York-San Francisco route, covered 1,750,000 miles. More than 49,000,000 letters, weighing 1,224,500 pounds, were transported by air.

* * *

In November, 1907, the United States Navy installed only twenty-six sets of radio telephones upon as many battleships, torpedo-boat destroyers, and auxiliaries, prior to their round-the-world cruise. The specifications called for five-mile transmission for inter-fleet work! Some of those instruments, crude though they were compared with the present type, maintained communications for fifty miles. To-day the Navy demands instruments capable of a hundred-mile conversation between warships and nearly as many miles between airplanes and ship stations.

* * *

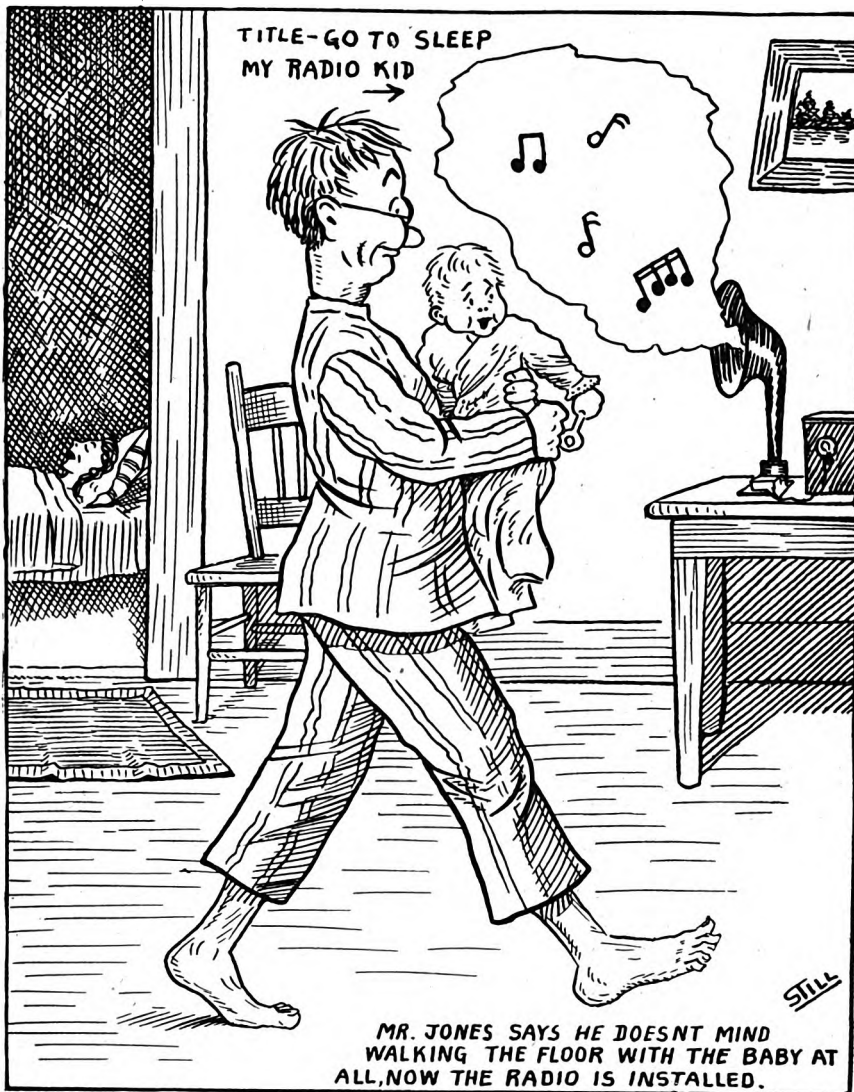
Listening in on the radio set at the Charles Street jail, Boston, George Rollins, convicted of the murder of Ordway Hall, a grocery store manager, in 1917, learned that Jesse Murphy, now in a Pennsylvania prison, had been pardoned by the Governor of that State and would be brought to Boston for trial on the charge of murdering Hall. Murphy, according to the police, has confessed the crime of which Rollins and his brother were convicted. Rollins threw off the headgear and cheered when he heard the news. Boston police officers left for Harrisburg, Pennsylvania, to take Murphy into custody on his release from the Eastern Penitentiary there. He has been serving a sentence for assault with intent to kill.

* * *

WGY, radio broadcasting station of the General Electric Company, will give a play-by-play report of the World Series baseball games. Direct wires to the baseball park will bring information of every play practically the second it happens and this will be relayed by wireless the instant received.

Radio Has Made It a Joy!

Cartoon by Harry R. Stillman



Court Grants Injunction in Radio Suit

Important Decision First Step in Clearing Up Crystal Patent Situation

AN important step in clearing up the somewhat tangled situation regarding radio patents was taken last week by Justice O'Malley of the New York Supreme Court, Special Term, in granting the injunction asked by the Freed-Eisemann Radio Corporation of New York against the Wireless Specialty Apparatus Company.

This decision is the first step of a series in defining patent rights which have arisen in the radio field as a result of the tremendously increased activity in this industry. The decision is of particular interest to all retailers of radio apparatus as well as to users of crystal-receiving sets.


It is stated that the Wireless Specialty Apparatus Company recently published a series of advertisements and circulars which indicated that crystal radio receiving sets are controlled by patents owned by them. These advertisements, which were addressed to radio dealers, advised these dealers to insist upon guarantees from other radio manufacturers,

holding them (the dealers) harmless in case suit was filed by the Wireless Specialty Apparatus Company, alleging patent infringements.

The contention of the Freed-Eisemann Radio Corporation, now sustained in the courts, was that these advertisements constituted unfair business competition and an injunction was granted restraining this form of advertising by the Wireless Specialty Apparatus Company. The injunction, just granted, was part of the suit—the balance of the suit, in which \$150,000 damages was asked, is still pending.

Justice O'Malley's decision is sweeping in the measure of relief afforded the plaintiff. The outcome of the suit will have an important bearing upon the entire crystal radio patent situation. It is stated, also, that a number of radio manufacturers, known as the Independent Radio Manufacturers, Inc., have organized to protect their members against unfair competition and unjust patent litigation.

This organization is represented by Pennie, Davis, Marvin & Edmonds, attorneys, 165 Broadway, New York City. At the offices of the Independent Radio Manufacturers, Inc., it was said by one of the directors that a large number of applications from radio manufacturers are now under consideration.



Be progressive—
enjoy wireless
programs daily
with the

MAGNAVOX
Radio
The Reproducer Supreme

No wireless receiving set is complete without it

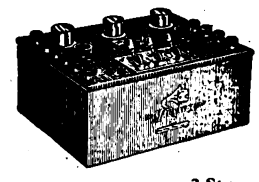
THE Magnavox Company have been pioneers in the development of devices for sound amplification. When you purchase a Magnavox Radio or Magnavox Power Amplifier you possess an instrument of the very highest quality and efficiency.

**Type R-2
Magnavox Radio
with 18-inch Horn**

THIS instrument is intended for those who wish the utmost in amplifying power; for large audiences, dance halls, &c., but requires only .6 of an ampere for the field.
Price, \$85.00

**Type R-3
Magnavox Radio
with 14-inch Horn**

THE same in principle and construction throughout as Type R-2, and is ideal for use in homes, offices, amateur stations, etc.
Price, \$45.00



3-Stage

**Magnavox
Power Amplifier
Model C**

INSURES getting the largest possible power input for the Magnavox Radio. Can be used with any "B" battery voltage which the power tube may require for best amplification.

AC-2-C, 2-Stage..... \$80.00
AC-3-C, 3-Stage..... 110.00

Magnavox products may be had of good dealers everywhere.

The Magnavox Co.
Oakland, California
N. Y. Office: 370 Seventh Ave.

**Radio brings it
MAGNAVOX tells it**

Answers to Readers

I HAVE a crystal set. What can be done to it so the sound may be increased? The concerts come in satisfactorily. Can I change the connections?—Addison Jones, Cairo, N. Y.

Every time the writer of this department receives a query like the above, he has to walk around and cool off. There is nothing that can be done to increase the volume of this type of set. **Don't change any wiring.** If you wish to get louder signs for the employment of a loud speaker, then, of course, you will have to discard the crystal and get a tube outfit.

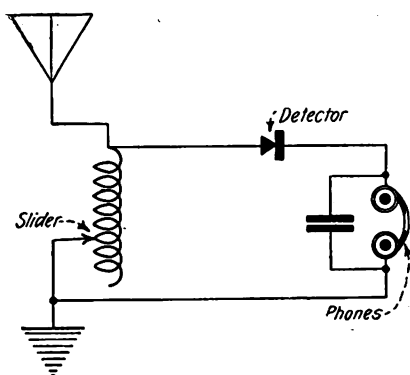
* * *

I have done some experimenting on Major Armstrong's superregenerative set. Will I be able to "get up" on 2,500 meters with a two-tube set? What should I look for in varying the taps of the vario-coupler? What resistance-head set should be used with this set? What type transformer is best to use?—Frank Piccolo, Montreal, Canada.

From most amateurs the reports seem to be that this wave length cannot be had as its amplifying powers are not available over 900 meters. Leave your primary vario-coupler switches at a maximum point, and tune with the variable condenser across the loop aerial for the station. This should be done very carefully. 3000-ohm receivers could be used, but we recommend the Baldwin telephone because of the tremendous amount of energy that is passed through the receiver. Even better results could be obtained by using the step-down transformer and a low-resistance telephone; but the Baldwin will answer the purpose very well.

* * *

Send me a hook-up of a simple tuning-coil with crystal detector and telephones? Beginner, Brooklyn, N. Y.



Hook-up requested by "Beginner," Brooklyn, N. Y.

The accompanying sketch shows the proper connections for a simple tuner and plain crystal-detector.

* * *

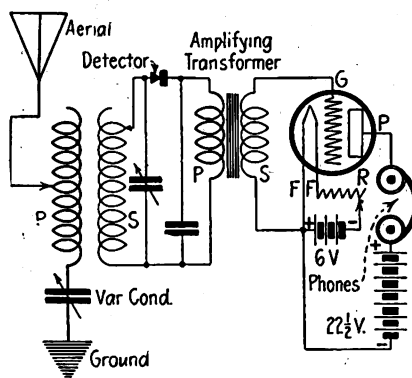
I have a regenerative set, consisting of a vario-coupler, grid and plate vario-meters. I receive concerts satisfactorily through the detector, but not the amplifiers. I have a good aerial and ground and am using Thordason amplifying transformers. Can you tell me where the trouble lies?—J. Stuck, New York City.

This is difficult to answer satisfactorily as you did not send a circuit. There may

be a number of things at fault such as poor B batteries, incorrect polarities, improper conditions, or poor tubes, we suggest that you submit a diagram of your set, in order that the trouble may be located.

* * *

I understand that an amplifier may be connected to a crystal set. Will you publish such a sketch? I believe it is impossible to connect this with a crystal detector.—Arthur James, Springfield, Mass.



Schematic diagram requested by Arthur James, Springfield, Mass.

The schematic diagram published above shows the proper connections utilizing a tube amplifier with a crystal detector. Watch your connections and use a UV-201 amplifying tube or any other type of amplifier tube. Satisfactory results may be expected if everything is wired correctly.

* * *

Where may Western Electric E tubes be purchased.—Maxwell K. Murphy, Eastport, Maine.

This tube is known also as the "VT2 Signal Corps." See the advertising columns of Radio World.

* * *

Would you please publish a vacuum-tube hook-up employing spider-web coils?—Roy G. Lane, Havana, Cuba.

This was fully described in Radio World, No. 22, dated August 26, in "How to Build a Spider-Web Coil Receiver," by Frederick J. Rumford.

* * *

How may I connect the tickler coil in your diagram in "Answers to Readers," Radio World, No. 22, dated August 26?—Drennan Miller, La Harpe, Ill.

The tickler coil is connected in series with the plate circuit of your detector tube and should be variable.

* * *

When measuring the wave length of an antenna, should I include the ground wire?—Paul Johnson, Fresno, Cal.

Yes, the ground wire must be accounted for and figured in as part of the aerial circuit when the wave-length range of a receiving station is being figured or calculated for wave length.

* * *

What is the correct capacity used with the Armstrong super-regenerative set described in RADIO WORLD, No. 19, dated August 5? This variable capacity is in series with the iron choke. I have seen many other hook-ups and they seem to give it as .005 mfd. This is in reference with

your C5 condenser as .001 mfd.—Marty Olsen, Arverne, L. I.

Regarding the variable condenser in series with the iron-core choke, Major Armstrong's own figures were .001 mfd. capacity, but he pointed out the fact that this would have to be varied according to the circuit itself and the character of the iron choke used.

* * *

Please publish the connections for a T-type aerial and show me how it should look when erected—also, the rat tail or lead-in.—Warren Dodge, Bloomfield, N. J.

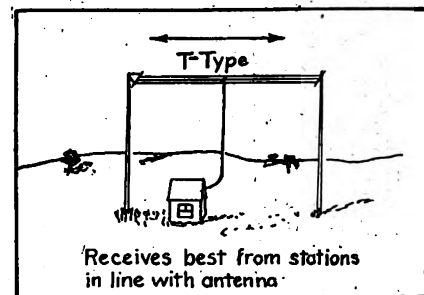


Diagram of T-type aerial requested by Warren Dodge, Bloomfield, N. J.

The accompanying sketch shows the T-type aerial with proper lead-in wires. The lead-in is taken from the center. This makes this type indirectional. It also decreases the wave length almost one-half.

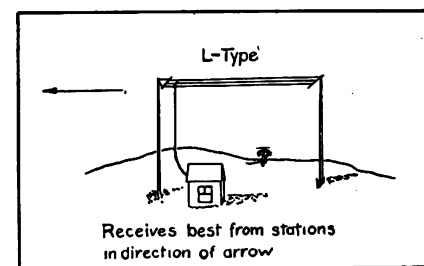
* * *

Publish a hook-up of a vario-coupler, variable condenser, and two radio-frequency transformers.—Ursin L. Cuevas, Cuevas, Miss.

This schematic diagram was explained thoroughly by George W. May in an article entitled, "Perfect Short-wave Radio-Frequency Amplification," in Radio World, No. 24, dated September 9.

* * *

In erecting an inverted L aerial, which end should the lead-in be taken from.—John Malcolm, Columbus, Ohio.



Inverted-L-aerial diagram requested by John Malcolm, Columbus, O.

The accompanying sketch shows the lead-in from an inverted L. The arrow indicates the direction from which the loudest signals will be received. This aerial is known as the direction antenna and will respond to signals at the end from which the lead-in is taken.

SO MANY READERS ARE disappointed in not receiving their copies of RADIO WORLD on the newsstands regularly, from week to week—due to early selling out by dealers—that we suggest that you place a standing order with your newsman. Ask him to save you a copy of every issue.

Nonagenarian Missionary To-day Radios to Former Fields

SIXTY-SIX years after he traveled Indian trails to the frontier of the nation, Reverend E. W. Rice, of Philadelphia, sent his voice with the speed of light to the grandchildren of the people he sought to reach in the early days, traveling by stage coach, on horseback, and afoot.

Dr. Rice, now in his ninety-second year, recently delivered an address, from WGY, the radio-broadcasting station of the General Electric Company, Schenectady, New York, and letters which have reached the station indicate that residents of Iowa, Minnesota, and Wisconsin, the field of his missionary travels in 1856, plainly heard Dr. Rice's talk on "The Viewpoint of a Nonagenarian."

With the aid of radio, the former missionary of the gospel was able to reach at one time people within a radius of many hundreds of miles of the point he was speaking from.

Dr. Rice is the father of E. W. Rice, jr., honorary chairman of the board of directors, of the General Electric Company and of M. P. Rice, manager of the publication bureau of the same company.

MBD Flashes Its "73"

MBD, the famous call of Pondhu, England, has sent its last message. A correspondent of "The World," New York, says that this well-known call for which ships' operators have listened eagerly for the last nineteen years, is now replaced by MFT, the sign of Clifden, the Irish station of the Marconi Company, which has taken up the duty of talking to people who go down to the sea in ships, telling them at midnight what has been happening throughout the world during the preceding twenty-four hours.

Poldou's last message was on a matter of business to the little Spanish Town of Cieza. Now the new wireless station at Ongar, in Essex, is responsible for this Spanish traffic.

Perched on the rockbound coast of Cornwall, Poldhu has made history. It was the first highpower wireless station to be built, and from here the first wireless message was sent across the Atlantic in a 2,000 metres wave-length, on December 12, 1901, to St. John's, N. F.

Coupling Defined

AMONG the many puzzling and mystifying terms with which the radio amateur must wrestle is the term coupling, says Arthur R. Nilson, A. M. I. R. E., in "The Globe," New York. He hears of loose, tight, critical, close, direct, flexible, inductive, capacity or electrostatic (static for short) and conductive coupling as well as co-efficient and percentage of coupling, and, last but not least, that ideal condition, perfect coupling.

Now, the question naturally arises: why all this coupling, what does it do and for what is it used? Coupling is to a radio set what gears are to an automobile. Unless set just right, things don't go well. Coupling is a verb, adjective, or pronoun or whatever else you might wish it to be. We say, couple the circuits closely, the coupled circuits are easily adjusted or the coupling was tight. Boiled down to a definition it might read as follows:

Coupling is the ratio of the mutual induction between two circuits compared with the self-inductance of each circuit.

Subscribe for Radio World, \$6.00 a year, \$3.00 six months, \$1.50 three months.

Remington Terminal Indicators

5 CENTS EACH



Type A

REMINGTON RADIO CORP., FRANKLIN, MASS.

A perfect panel engraving imitation. Fits any binding post. Black japanned, white enameled letters. Supplied in the following: Antenna, Ground, Phones, Grid, Input, Output, A Bat +, A Bat -, B Bat +, B Bat -. Lettering in two positions. Order direct from ad.

Dealers! Write for Discounts!



Type B

"TUNING IN"

TO THE RIGHT TUNE IS VERY SIMPLE WHEN YOUR CONNECTIONS ARE
SOLDERED WITH THE NEW

"POST SOLDERING IRON"

(The Iron with the Platinum Heating Unit). Removable Soldering Tip



1/2 Actual Size

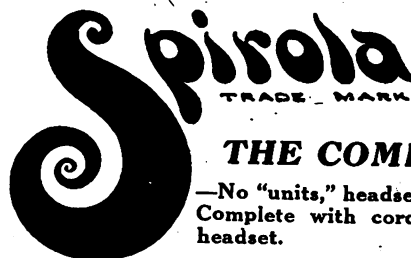
LIST \$6.00

Designed especially to cover every requirement for delicate work. The smallest practical, efficient instrument on the market. Attaches to any socket. Universal current. Fully guaranteed. From your jobber or write

POST ELECTRIC COMPANY

38 EAST 42ND STREET

NEW YORK



TRADE MARK



PATENT PENDING

THE COMPLETE LOUD SPEAKER

—No "units," headsets, extra batteries or adjustments required.
Complete with cord, ready to connect in, in place of your headset.

LOUDNESS—Just a sample of actual performance. In our testing laboratory, using a small outdoor aerial and an ordinary set with two stages of amplification (the ideal set for average conditions unless near a broadcasting station) we have received broadcasting stations more than six hundred miles away, so loud it can be heard a hundred feet away. Or again, while this compact little instrument (it stands less than eight inches high) is designed for home use rather than for large halls—yet with the same set stations thirty miles away come in somewhat louder by direct comparison than a full sized phonograph playing a loud record with a loud steel needle.

And TONE—While we welcome comparison on loudness, what will really impress you



"Spirola Speaks"

most about your SPIROLA CONCERT is the tone. We have absolutely eliminated distortion and all metallic, "tinny" quality. Violin, orchestra music, voice, even the difficult piano come to you through your SPIROLA so clear and natural you can hardly believe they are not in the same room.

Beautiful cabinet type, choice of dark oak or mahogany finish, bronzed throat; at your dealers or prepaid anywhere in the U. S., Canada or England \$12.50

We are so sure you will be pleased with your SPIROLA CONCERT that we absolutely guarantee it. If you wish to return your SPIROLA for any reason whatsoever, do so within ten days and your money will be immediately refunded. Made and sold by

L. H. Donnell Mfg. Co., Dept. B, Box 70, Ann Arbor, Mich.

A Fitting Birthday Present for Those Interested in Radio

Are you cudgeling your brain in an effort to think of an appropriate present for a relative or friend? If that relative or friend is interested in radio, WHY NOT SEND HIM OR HER RADIO WORLD FOR THE COMING twelve months? Send us \$6.00 for each subscription you want, and we will place the names on our subscription list for one year, postpaid, and we will also send special cards to the addresses you send us announcing that the subscriptions were sent with your compliments.

Address Subscription Department, Radio World, 1493 Broadway, New York City, N. Y.

SUBSCRIPTION BLANK

RADIO WORLD

RADIO WORLD

1493 Broadway, New York City.

Please send me RADIO WORLD for months, for which
please find enclosed \$

SUBSCRIPTION RATES:

Single Copy \$.15

Three Months 1.50

Six Months 3.00

One Year (52 Issues) 6.00

Add \$1.00 a Year for Foreign
and Canadian Postage.

Digitized by Google

Advertising Rates, Display, \$5.00 per inch, \$150.00 per page

Radio Merchandising

Classified Quick-Action Advertising, 5 cents per word

Telephone Bryant 4796

Making an Asset of Difficulties

A great opportunity is now before American business—the opportunity of making a big and permanent asset out of the very difficulties of the present situation. The conviction that this can be done is extremely heartening. It is enough to put a new thrill of life and activity into every form of industry.

From one point of view the present situation is by far the most desirable, the soundest, the sanest, and the most hopeful this country has ever seen. Why? Because it brings into bold relief, through sheer necessity, the latent power to create conditions as we would like to have them.

The curtailment of Demand for the products of industry brought us face to face with the question, hitherto ignored, as to what causes demand. Then it was discovered that Demand was a created thing, and that more of it could be created in almost any direction—if enough of the right effort were applied.

Chief among the means of creating Demand is now seen to be Advertising. Wherever you find a big demand for any product, you find, invariably, that the demand for that product has been stimulated by human effort, and chiefly through advertising.

It is obvious to any one who will think it through that the present demand for any product could be substantially lessened if it were possible to eliminate all forms of advertising—including pictures, displays, and word of mouth, as well as printed and painted messages—and just let that product depend on the natural or unstimulated demand.

And it is equally obvious that a demand for any worthy product can be created and stimulated by means of Advertising.

This fact puts within the hands of the business man the means of creating his own market. That would be the biggest asset he could have—an assured market for all he could produce.

[Published by RADIO WORLD in co-operation
with The American Association of Advertising Agencies]

Radio Goods that Stand the Test

Manufacturers, send a sample of your goods to our Technical Editor, Fred. Charles Ehlert, 9006 Pleasant Street, Queens, Long Island, N. Y. It will be carefully tested and returned. If your goods satisfy our experts, RADIO WORLD'S endorsement will be published in our merchandise department without charge or obligation of any kind on your part. This is a free service on the part of RADIO WORLD, calling for no expense whatsoever on the part of the manufacturer, except the sending of a sample of his goods.

Micon Noiseless Mica Condenser

(Chas. Freshman Co., Inc., 290 Hudson Street, New York City)

A .00025-MICROFARAD MICON mica condenser was tested out in the Armstrong superregenerative set with amazing results. It must be remembered that condensers play an important part when working with this circuit.

Micon fixed mica condensers are new departure in condenser design. The outer casing is of seamless brass, or copper, tubing. The interior is built up after the best practice of alternate layers of clear Ruby India Mica and brass, or copper, sheets. The tubing is partially flattened then the condenser elements are inserted and the presses complete the operation of flattening into the final form. This process produces constant equal pressure over the entire plate-area and does away with troublesome noises of ordinary condensers. The metal case

protects the plates and reduces hysteresis to a minimum. Ordinary receiving-condensers are tested to 1,000 volts by these condensers are also made to stand several thousand volts if desired.

Micon is manufactured under license of patents of Charles T. Vawter, of the Thompson Levering Company, Philadelphia, by Chas. Freshman Company, Inc., 290 Hudson street, New York. The manufacturing is in charge of Ernest Walker Sawyer, the well-known radio engineer of New York and London.

A Useful Microdenser

(E. R. Knott Machine Co., 1 Ellery Street, South Boston, Mass.)

THE Knott Microdenser is an instrument that gives the tuning on a variable condenser. The critical point may be stretched out on the vernier condenser provided the Microdenser is employed with it. The Microdenser works well on long-distance work, but is not a necessity on local operation. It is adapted for C-W work.

New Firms and Corporations

(The firms and corporations mentioned in these columns can be reached by communicating with the attorneys, whose addresses are given whenever possible.)

Radio Taxi Corporation, Manhattan; \$10,000; W. and B. Bettinger, P. Sherman. (Attorneys, Cohen, Gutman & Richter, 111 Broadway, N. Y.)

Poellnitz Electric Service Corporation, New Rochelle; \$10,100; W. C. Poellnitz, E. J. Boule, T. Smith. (Attorneys, Mahstedt & Fallon, New Rochelle, N. Y.)

Arras Equipment Corporation, Manhattan, mechanical and electrical apparatus; \$5,000; T. N. Pfeiffer, M. P. Bloch. (Attorney, N. J. Palzer, 120 Broadway, N. Y.)

Moss Radio Supply Company, Manhattan; \$10,000; H. A. and M. G. Moss, S. Schatzberg. (Attorney, L. Susman, 3208 Third Ave., N. Y.)

Dectograph Manufacturing Company, Wilmington, Del., manufacture; \$1,000,000. (Colonial Charter Co.)

Deluxe Radio Corporation, Wilmington, Del., apparatus; \$500,000. (Corporation Service Co.)

F. Wilsonville Electric Corporation, Manhattan, X-Ray equipment; \$10,000; F. W. Ille, J. Ferguson, J. Wolfert. (Attorney, M. F. Eichner, 1545 Broadway, N. Y.)

The Electrocar Corporation, Philadelphia, has increased its capital stock from \$500,000 to \$33,000,000.

Canadian-American Radio Company, Dover, Del.; \$41,000,000; Frank Kweton, West New York, N. J.; L. F. Slinfin, Yonkers, N. Y.; Earl L. Keys, New York. (Corporation American Radio Co.)

Archer Radio Company, 2309 Archer Ave., Chicago. Adolph Holman.

Beatrice Radio Company, 808 East Court St., Beatrice, Neb. D. M. Church, manager.

Washington Radio Shop, Washington Boulevard and Clifford St., Detroit, Mich.

Rose Radio & Electrical Supply Company has moved to 129 Camp St., New Orleans, La.

Central Radio Co., 454 South 5th St., Louisville, Ky. S. B. Kirby, proprietor.

Roth Radio Co., 1000 Elm St., Dallas, Texas.

Radophone Supply Co., 1907 Main St., Dallas, Texas. W. H. Fine, manager.

The F. A. Empsall Department Store Co., Watertown, N. Y., has added a radio department.

Jacob G. Hardin, radio supplies, Greenwood, Johnson Co., Indiana.

Duchess Battery & Radio Corporation, Poughkeepsie, 5,000 shares preferred stock, \$50 each, 10,000 common, no par value; active capital, \$5,000; H. Eggleston, F. J. Slater, F. Blown. (Attorney, C. W. H. Arnold, Poughkeepsie, N. Y.)

The Baldwin Radio Company of Salt Lake City, Utah, capital \$1,000,000, has been organized and completely financed. The officers are David A. Smith, president; Lester D. Freed, vice-president, and J. F. Nibley, secretary and treasurer.

It is well designed of neat construction. Simply connect the wire on the end of the Microdenser rod to the terminal of the moving plates of your variable condenser and connect the other wire to the stationary terminal. Adjust your variable condenser to the whistle and then the Microdenser, by a simple operation, will bring in the signals.

Visible-Stop Rheostat

(E. R. Knott Machine Co., 1 Ellery Street, South Boston, Mass.)

THE Knott positive, visible-stop, dial Rheostat was tested out with various tubes in various circuits. It has for its main purpose a scale which is encased around the knob. When in use a pointer over the scale immediately indicates every turn on the rheostat. This is a serviceable stunt, as a record may be kept, from day to day of adjustments, also the condition of the battery. It indicates, also, when the electricity is turned off.

Results

IN selecting an advertising medium to merchandise radio goods—what do we buy—Circulation?

Who cares how much circulation a paper has if it does not pull—produce profitable results—orders?

Who cares how old a publication is—if the younger publication brings more orders for the advertising dollar? In the final analysis, it is only reader-interest and RESULTS that counts.

Radio World has a greater reader-interest than any other radio paper. Why? Because it is the only national illustrated radio weekly. It illustrates and fully describes, each week, all that is new in radio. It gives all the new marvels in radio from four to six weeks before the monthly radio-publications can copy it. To be up-to-date in radio, one must read Radio World each week. As a weekly we are not obliged to jam all advertisements in one issue. The reader's attention and the advertisement's individuality are lost when sandwiched in between a hundred or more pages of other radio advertising, as it is in some of the monthlies. In Radio World, every advertisement is next to interesting radio news.

To buy advertising profitably, the most important thing to consider is results—profit—the pulling power of the publication. Sentiment and prejudice make poor guides. The volume and the kind of results competitors get from a publication, comprise the best reason for knowing in advance what you can expect from your advertising dollar in that particular publication.

Champlain Manufacturing Company, 90 West Broadway, New York state that within three days after the appearance of their first four-inch double-column advertisement in Radio World, they could trace sales of over 20,000 rheostats. In other words, a forty-dollar advertisement in Radio World sold for them \$20,000 worth of rheostats in three days! Radio World is the one quick-action radio-advertising medium.

For example: The Wholesale Radio Equipment Co., 24 West William Street, Newark, N. J., informs us that within two hours from the time Radio World was put on the news stands, their small advertisement brought them \$5,000 worth of orders. Another important thing is that this house does exclusively a wholesale business, proving that dealers read Radio World.

The Liberty Radio Company, Church and Liberty Streets, New York, advertisers in various radio magazines, and newspapers having radio sections, inform us that 90 per cent. of their entire results from advertising could be traced to Radio World.

The greatest test, probably, is reported by Radio Guild, 256 West 34th Street, New York. This firm used thirty-three publications, among them a publication having a circulation of nearly two million. They wrote us, on June 24 last, that as a result of this campaign in which they got over 12,000 cash orders, over 6,000 came DIRECTLY from Radio World.

The Lincoln Advertising Service, Inc., 265 Fifth Avenue, New York, placed an advertisement of Lefax, Inc., in the six leading radio-publications, one a monthly whose rate is four times higher than Radio World's. They inform us that from an actual keyed test, Radio World pulled "three to one."

We feel that these two letters conclusively prove that it is not the volume of circulation, but the reader-interest that brings profitable results.

Copies of these wonderful result-tests are yours for the asking.

It is on this evidence of results that we feel you should advertise in Radio World. It offers you an audience of over 70,000 radio buyers, many of whom have never heard of you or seen your advertisement. Radio World offers you a virgin field in which to garner your orders.

Our advertising rates, today, are but \$150 per page or \$5 per inch. On a four time order \$4.50 per inch. Our minimum rate on a 13- to 52-time order is \$4.25 per inch. We probably shall double our rate in the next 60 days, and if the present increase in circulation maintains, it will be \$15 per inch by next spring. That's why the leading houses are giving us 52-time orders, using a one-inch rate holder and using pages, half or quarter pages, as they see fit.

The latest lists obtainable show:

Retail Radio Dealers.....	9,270
Radio Manufacturers.....	1,684
Radio Supply Jobbers.....	1,307
Radio Broadcasting Stations.....	360

It is estimated that only one-half of these, about 5,000 retail dealers, carry a full line of radio goods. There is said to be one million receiving sets now in use. It is predicted there will be three million by this time next year.

ADVERTISING RATES:

One inch, one time.....	\$ 5.00
One page (31½ inches).....	150.00
Classified, a word.....	0.05

SUBSCRIPTION RATES:

Per copy.....	\$0.15
Yearly (52 issues).....	6.00
Six months.....	3.00
Three months.....	1.50

10 per cent. discount for four times; 15 per cent. discount for 13 times.

Write Fred S. Clark, manager,
Radio World, 1493 Broadway, New York, N. Y.,
for "Brass Tack" Facts on Radio Merchandising.

Plans for the American Radio Exposition

ANNOUNCEMENT has been made of the plans for the American Radio Exposition to be held in Grand Central Palace, New York City, from December 21 to 31 next, under the direction of the American Radio Exposition Company, 120 Broadway. Radio apparatus, accessories, and ma-

terials will be exhibited by manufacturers and dealers and there will be daily orchestral concerts, numbers by grand opera artists, broadcasting, illustrated lectures and other entertainment and educational features, the company announces.

The practical uses of radio and the prin-

Coming Events

The editors of RADIO WORLD will gladly publish news items of all contemplated radio shows and expositions. Keep us posted by mailing full information.

ANNUAL SHOW OF THE ST. LOUIS RADIO ASSOCIATION, St. Louis, Mo., October 4 to 7, inclusive.

CHICAGO RADIO SHOW, Coliseum, Chicago, Ill., October 4 to 22. U. J. Hermann, managing director, 549 McCormick Building.

KANSAS RADIO EXPOSITION will be held at the Kansas State Fair, Hutchinson, Kansas, September 16 to 22, inclusive. A. L. Sponsler, secretary.

RADIO CLUB OF AMERICA. First autumn meeting will be held the last Friday in September. Renville H. McCann, secretary, Columbia University, New York.

CINCINNATI RADIO-AND-ELECTRICAL EXPOSITION, Music Hall, Cincinnati, O., October 7 to 14, inclusive.

NEW YORK ELECTRICAL AND INDUSTRIAL EXPOSITION, Grand Central Palace, New York City, October 7 to 14, inclusive.

NEWARK'S SECOND ANNUAL RADIO SHOW, Robert Treat Hotel, Newark, N. J., October 4, 5, 6 and 7.

SECOND NATIONAL RADIO EXPOSITION, direction International Trade Exposition Co., Chicago, January 13 to 20, inc., 1923, George A. King, director of publicity, 417 South Dearborn Street, Chicago, Ill.

PERMANENT RADIO FAIR FOR BUYERS, Hotel Imperial, New York City. Open from September, 1922, to May, 1923.

AMERICAN RADIO EXPOSITION, Grand Central Palace, New York City, December 21 to 31, inclusive. Direction American Radio Exposition Company, 120 Broadway.

BOSTON RADIO EXPOSITION, AND NEW ENGLAND AMATEUR CONVENTION, Mechanics Building, Boston, October 30 to November 4, inclusive.

SPRINGFIELD RADIO EXPOSITION, Springfield Auditorium, Springfield, Mass., October 3 to 7, inclusive.

ELECTRICAL RADIO AND AUTOMOBILE ACCESSORY EXPOSITION, Smith's Academy, Passaic, N. J., September 14, 15, 16.

ciples on which it operates will be explained through the medium of motion pictures and by actual demonstration of apparatus. There will be a lectures by a prominent engineer on Senator Marconi's latest development in directed wireless. Senator Marconi has loaned his original equipment, and a duplicate of it will be exhibited and demonstrated in conjunction with the lecture.

Sound-proof rooms for the demonstration of loud-speaking devices will be constructed by exhibitors, each room to have a window opening on the street or area-way so that it may be ventilated without interfering with the demonstration of other apparatus.

Various other activities are now being planned by the officers and directors of the company. They are Frank Hitchcock, president; Walter Gordon Clark, consulting engineer of New York, vice-president; Harold Bolster, head of Bolster & Co., New York, secretary and treasurer; George Brokaw Compton, of the New York law firm of Peaslee & Compton, and Chester Humphrey, vice-president of the Old Colony Trust Co., of Boston, directors.

The two main floors of Grand Central Palace have been leased and an option has been obtained on the third floor. The co-operation of the Radio Corporation of America has been assured. The Radio Corporation will exhibit its latest equipment.

Trade Note

GORDON C. SLEEPER, of the Sleeper Radio Corporation, 88 Park place, New York City, was one of the active organizers and was present at the first meeting of the National Association of Radio Manufacturers which grew out of the radio apparatus section of the Manufacturers of Electrical Supplies, and which is doing much to protect the interests of manufacturers of radio apparatus.

\$1

COMPLETE POST PAID
W.E. NICHOLS WHITE PLAINS N.Y.

Law Storage Battery
Constant voltage, large amperage. Will run two months without recharging.
Attractive Dealers' Discounts
Write for Details
WILLIAM LAW COMPANY
Aborn and Sabin Streets, Providence, R. I.

Variable Air Condensers
(Knock-Down Only)
Made with Pure Aluminum Die-Cut Plates
45-Plate\$2.25
25-Plate\$1.85
15-Plate\$1.50
5-Plate (Vernier)90c.
Includes all necessary parts, with instructions for assembling.
THE EDDY-MARSH COMPANY
95 Westminster Street Providence, R. I.

NA-ALD
DE LUXE
V. T. SOCKET

Contact strips of laminated phosphor bronze press firmly against contact pins, regardless of variation in length. No open current trouble possible. Socket moulded from genuine Condensite. Practically unbreakable. Special protected slot, with exterior reinforcement. Unaffected by heat of bulbs or soldering iron. All excess metal eliminated, aiding reception. May be used for 5 Watt power tube.
Highest quality throughout. Price, 75c.
Special proposition for dealers and jobbers.
ALDEN-NAPIER CO.
Dept. L.
52 Willow St. Springfield, Mass.

**KNOCKED-DOWN
VARIABLE CONDENSER**
MONEY-SAVING PRICES
An accurately made, fully efficient instrument that cannot get out of order or adjustment. Fully guaranteed. Extra heavy aluminum plates. Condensite and pieces. Knob and pointer included. Furnished assembled or knocked-down at the following low prices. Ready assembled by anyone following instructions furnished. Save money—order from us. Forder upon request.

No. of Plates	M.F.D. Capacity	Assembled	Knocked-down
3	.00007	\$1.75	\$1.50
11	.00025	\$2.50	\$2.00
21	.0005	\$3.25	\$2.50
43	.001	\$3.90	\$2.90

Lott's Better Radio Condenser Co.
475 ORANGE STREET NEWARK, N. J.

NOVO
"B"
BATTERIES FOR RADIO
22½-45 & 105 VOLTS

**NOISELESS
DEPENDABLE
GUARANTEED**
ASK YOUR DEALER
NOVO MANUFACTURING CO.
424-438 W. 33rd ST.
NEW YORK
531 SO. DEARBORN ST. CHICAGO.

Every Amateur on His Own Wave Length

WITH the advent of cooler weather, which is to bring with it tremendous demands for radio broadcasting, there is arising a certain amount of bitter feeling against the amateur who either is transmitting code or testing his home-made broadcasting station. In the larger cities these amateurs are becoming so numerous, and are in many cases so disregarding the government regulations regarding wave lengths, that they rapidly are becoming hindrances to the thousands of persons who desire to listen to the music, lectures, news, etc., being broadcast by the larger and more efficient stations.

Now there is no getting away from the fact that the amateurs have as much right to operate as have the broadcasting stations, they have as much right to fulfill their desires for pleasure as have the owners of receiving sets and have as much right to attempt to improve their work as have the more powerful plants. But it must be remembered by them that there are government regulations forbidding them operating on other than certain wave-lengths and that when they violate these regulations the chances are they are infringing upon the pleasures of their neighbors. No one believes any of the amateurs who are preventing others enjoying concerts are doing so intentionally, and it has been proven that a call on the air or on the wire phone will result in the amateur either returning to his correct wave or standing by until after the close of the program with which he is interfering.

In Cincinnati this is especially true. There are a few who have been "butting in" during the concerts broadcasted by the Crosley Manufacturing Company, operators of the station WLW, and on numerous occasions persons listening in have telephoned that company. A request has been made that the operating amateurs be reported to the government. There was a serious problem faced by WLW. Persons in charge of the station did not desire to report offending amateurs, and still they did not want to have marred the pleasures of the men, women, and children who listen in every time the station opens up. And so, instead of sending reports to Washington, reports which in all probability would have resulted in the cancellation of some amateur's license, the following message was broadcast:

"We understand some amateur in or near Cincinnati, sending code, is operating on a 360 meter wave and is interfering with our concert. The operator doing this either knows he is violating government regulations, or is operating in ignorance of the fact that he is far off his own wave. We would appreciate it if this person, who is operating station —, would stand by until the close of our concert."

The effect was instantaneous. Either the operator or someone in his station was listening in, and no sooner had the message been broadcasted by WLW than the amateur signed off. Now WLW has a friend it would not have had had a different course been pursued. The following day the amateur operator came to Crosley Company with an apology, and never since that night has a Cincinnati amateur operated on a wave that interferes with the music broadcast by WLW.

A Radio Necessity!

Latest broadcasting map 15c. That is, a complete broadcasting map appeared in Radio World, No. 8, dated May 20. Mailed on receipt of 15c. Radio World Company, 1493 Broadway, N. Y. C.

Attention
Vacuum Tube Users
SAVE \$1.50 ON DETECTORS
SAVE \$3 ON AMPLIFIERS

REPAIRING
Marconi, Moorhead, Electron Relay, A. P.
Radiotron UV200—UV201
Cunningham C-300—C-301
Detectors for \$3.50 Amplifiers \$3.50

Prompt Deliveries, Satisfactory Results
Reasonably Guaranteed

GEO. H. PORELL CO., INC.
CUTTER SQUARE WEST SOMERVILLE, MASS.

LOWEST PRICES
FORMICA RADIO PANELS
3/16 in. thick, cut to size, per sq. in.2c.
MAGNET WIRE, per 1/2 lb. Spool
B.&S. Gauge Enam. D.C.C. D.S.C.
22\$0.40 \$0.68 \$1.22
2448 .79 1.41
2654 .96 1.72
2858 1.12 2.08
HUGHES ENGINEERING CO.
P. O. Box 57 Terrace Park, Ohio

Welcome! Come in and hear the

Coraco

Radio Concert

Daily, 9 A. M. to 5 P. M.

18th Floor, 220 W. 42nd St., next to
Amsterdam Theatre

The Coraco Super-Radiophone is the latest and greatest improvement in radio, it has no outside connections—no installations expense—is as simple to operate as a phonograph. If you cannot call, write for full information.

The Coraco Company, Inc.
220 West 42nd Street New York

Buy Your Radio Receiving Set at Manufacturers' Cost

Buy your Radio Supplies at a large discount below the list or retail price. If a saving of \$15.00 to \$140.00 on a Radio Receiving Set or if a saving of 25% to 40% on Radio Supplies interests you, write or telegraph us today.

KING RADIO MFG. COMPANY
521 Penn Ave. Wilkesburg, Pa.

Pictures and Facts About Armstrong Amplifier

Radio World has published a number of pictures, diagrams and descriptive articles regarding the New Armstrong Super-Regenerative Amplifier. The numbers containing this material are dated June 24, July 8, July 15, and August 5. They will be sent postpaid on receipt of 15 cents each, the four copies complete for 60 cents. Or you can subscribe, \$6.00 year; \$3.00, six months; and have your subscription start with the number dated June 24. RADIO WORLD CO., 1493 Broadway, New York.

NOW THAT YOU ARE BACK FROM YOUR VACATION—

Be sure to see that your file of RADIO WORLD is complete. There will soon be so great a demand for back numbers that the supply will not be sufficient to cover it. RADIO WORLD has been issued every week from April 1 to date (22 numbers up to August 26th issue). Mail, postpaid, for 15c a copy; any seven copies for \$1.00. The first 22 copies sent on receipt of \$3.00. Or send \$6.00 for one year (52 issues) and have your subscription start with No. 1—RADIO WORLD, 1493 Broadway, New York City.

The Octagon Elec. Co.

We Make and Install Complete Radio Sets.
Full Line of Accessories Carried in Stock.

The Octagon Elec. Co.

219 West 14th St. New York City

The Nelson Radio Parts Co.

Manufacturers and Distributors of

RADIO APPARATUS

Write for Catalog.

89 ACADEMY STREET, NEWARK, N. J.

Tel. Market 4066

Rocky Mountain Crystals

BETTER THAN GALENA

The most sensitive mineral rectifier known. Can also be used with one or more stages of amplification.

Mounted, 35c.; Unmounted, 20c.; Postpaid Manufacturers, Jobbers, Dealers, Clubs, Apply for Special Trade Prices

Rocky Mountain Radio Products, Inc.

9 CHURCH ST., NEW YORK, N. Y.

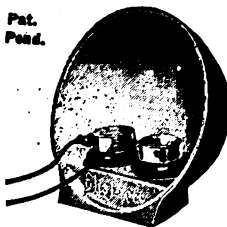
RADIO MAILING LISTS

8900 RETAIL RADIO DEALERS covering the United States, by states, price per thousand.....\$7.50
898 Radio Manufacturers, per list.....10.00
1022 Radio Supply Jobbers, per list.....10.00
260 Owners of Radio Stations, per list.....4.00
14000 Radio Amateurs and Managers of Radio Stations, per M.....7.50

These are neatly typewritten and ready to send on receipt of remittance covering the amount. Guaranteed 98% correct.

TRADE CIRCULAR ADDRESSING CO.
166 W. ADAMS STREET CHICAGO, ILL.

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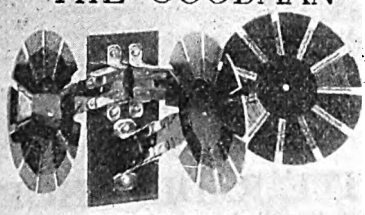
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Dr. Miller, of Chicago, writes: "My perfectly good variometers and vario-coupler now go into the discard."

The Human Body as An Aerial

THE radio novice, studying the exterior mechanism of the receiving apparatus, while listening to a broadcasting program, is likely to discover, to his consternation, that he can change music into discordant squeals and squawks by putting his finger against the grid-leak or a transformer, or merely by passing his hand near some part of the sensitive tuning apparatus, says Henry Smith Williams, in "The American," New York.

If he seeks an explanation of the anomaly, he is told that "body capacity" has done it. And this means, in simple English, that a charge of electricity from the body has entered into the delicately adjusted circuit of the radio apparatus, putting the receiver "out of tune."

Such an experience serves to give tangible evidence that the human body is, in effect, an aerial sharing with the wires of the radio apparatus a capacity to store electricity. In the technical phrase of the radio fan, the body, like the wired aerial, has "inductance," and "capacity." It transmits electricity as well as stores it. It also offers a certain resistance to the passing of an electric current. And since these qualities are essential characteristics of the apparatus with which the radio operator traps the radio waves and brings the message-bearing current to his receiver, it follows that the human body is virtually an aerial.

Moreover, it has been shown that on occasion the body can practically take the place of the ordinary aerial of wire.

The body is not an efficient aerial, however, but its efficiency may be enhanced by winding a few coils of wire about the waist, as was done recently by one of Signor Marconi's assistants in testing a sensitive amplifier.

The time will probably come when people will go about their regular business wearing a wired belt for aerial, and carrying an invisible apparatus in a pocket, like a watch. To make this feasible, nothing more is required than to condense the radio-receiving apparatus to compact form, as the original grandfather's clock timepiece was condensed to make a watch. Perhaps we shall even be able to do away with the belt, and let the body serve as aerial.

Many boys have made "freak" radio-receiving sets of diminutive size. One such is in a match box; another, shaped like a ring. But these are relatively feeble receivers, of the crystal-detector type, and they require more or less cumbersome aerials. The desideratum is a vacuum-tube set divested of long aerial wires and of large batteries. Such a set will probably be an achievement of the near future.

Radio-Frequency Sets

DESPITE the fact that radio-frequency amplifying apparatus is tricky and difficult to build and handle, there have now appeared on the market a number of radio-frequency units, says "The Scientific American," which may be used in connection with the usual receiving set, as well as complete receiving sets with one-, two- and even three-stage radio-frequency amplifiers, a detector, and one or two stages of audio-frequency amplification. It is still too soon to say just how efficient these manufactured radio-frequency amplifiers are, but we hope that they are thoroughly practical and devoid of all the experimentation that generally goes along with a home-made radio-frequency outfit.

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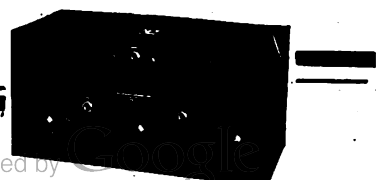
The PAN-AUDIO is made of solid mahogany, hand rubbed to a furniture finish. The panels are of best grade bakelite, carefully engraved, with nickel-plated binding posts and invisible wiring. May be used with any type of receiving set.

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Fifty-two issues for \$6.00. Sub. Department, Radio World, 1493 Broadway, N. Y. C.

Over the Hertzian Waves

WGY, Schenectady, N. Y., Sept. 12-15 inc.

WGY, the radio broadcasting station of the General Electric Co. at Schenectady, N. Y. introduced its new fall schedule of Monday evening, September 11 with the presentation of "The Garden of Allah," the drama founded on Robert Hichens's novel. Edward Smith and players who made such a pronounced success recently in the radio production, "The Wolf," by Eugene Walters, will read the story in three episodes.

The station will offer programs of entertainment, in the future, four nights a week, Monday, Tuesday, Thursday and Friday with an extra program every Friday at 10:30 p. m. eastern standard time. A daily program of music and addresses was added Monday, September 11. At 2 o'clock every day, except Saturday and Sunday, musical numbers will be transmitted and also short talks of special interest to women.

(All time references are Eastern Standard Time. If your community is on Daylight Saving Time, programs will be one hour later.)

Wednesday, September 13

P. M.
12:00—United States Naval Observatory time signals.
12:30—Noon stock market quotations.
12:45—Weather forecast on 485 meters.
2:00—Music.
6:00—Produce and stock market quotations and reports; baseball results; news bulletins.

Thursday, September 14

12:00—United States Naval Observatory time signals.
12:30—Noon stock market quotations.
12:45—Weather forecast on 485-meter wave length.
2:00—Music.
6:00—Produce and stock market quotations; baseball results; news bulletins.
7:45—Concert program.
Soprano solo: Pilgrim's Song.....Tchaikowsky
Jeanne Woolford
Cornet solo: Serenade.....Gounod
Frederick J. Clinknick
Soprano solo: A Dream.....Bartlett
Master Walter Sickles
Reading: The Vagabonds.....Trowbridge
William Nugent
Soprano solo: The Danza.....Chadwick
Jeanne Woolford
Cornet solo: Polka, "The Bride of the Waves".....Clarke
Mr. Clinknick
Soprano solo: Oh, for the Wings of a Dove.....Mendelssohn
Master Sickles
Reading: Whisperin' Bill.....Bachelor
Mr. Nugent
Soprano solo: Trees.....Fergus
Jeanne Woolford
Cornet solo: The Volunteer.....W. Rogers
Mr. Clinknick
Soprano solo: Still Wie Die Nacht.....Bohm
Jeanne Woolford
Readings: (a) Lettie Batiste.....Drummond
(b) If.....Kipling
Mr. Nugent
Soprano solo: Ray of Sunshine.....Di Capua
Master Sickles
Piano solo: Fantaisie Impromptu, Op. 66.....Chopin
Harold Bauer—Duo-Art
Soprano solo: Rondel of Spring.....Bibb
Jeanne Woolford

Friday, September 15

P. M.
12:00—United States Naval Observatory time signals.
12:30—Noon stock market quotations.
12:45—Weather forecast on 485-meter wave length.
2:00—Music and address on "Thrift in the Household."
6:00—Produce and stock market quotations; baseball results; news bulletins.

6:30—"How the Rhinoceros Got His Skin," from Kipling's Just So Stories. Kolin Hager, reader.

7:40—Health talk: "Scarlet Fever," by Herman M. Biggs, New York State Health Department.

7:45—Concert program.

Piano solo: Spring Dance.....Grieg

O. G. Yettru

Violin solo: Concerto (2nd movement), Mendelssohn

Tom De Stephano

Soprano solo: My Mother Bids Me Bind My Hair, Haydn

Miss Gladys Davey

Miss Smith, Accompanist

Quartet: A. The Mill.....Raff

B. Interludum in Modo Antico, Glazounwo

WGY Instrumental Quartet; Edward Rice, Leader

Piano solo: To a Wild Rose.....MacDowell

O. G. Yettru

Quartet: A. Drink to Me Only with Thine Eyes, Old English, Pochon

B. Spring.....Grieg

WGY Instrumental Quartet; Edward Rice, Leader

Soprano solos: A. I Meant to Do My Work Today, Dent Mowry

B. There Are Fairies at the Bottom of Our Garden.....Lehmann

Miss Gladys Davey

Miss Smith, Accompanist

Quartet: Andante Cantabile.....Tchaikowsky

WGY Instrumental Quartet; Edward Rice, Leader

Violin solo: Melodie.....Huerter

Tom De Stephano

Soprano solo: Care Selve (Atalanta).....Handel

Miss Gladys Davey

Miss Smith, Accompanist

Instrumental Quartet: Finale, from the American Indian Quartet.....Dvorak

WGY Instrumental Quartet; Edward Rice, Leader

Friday, September 15 (Late Program, 10:30 p. m.)

Orchestra: A. March, Behind the Hounds...Allen

B. Walze, Dreamy Hawaii, Wandersloot

C. Fox Trot, Lonesome Mama Blues, Brown

WGY Instrumental Quartet

Tenor solos: A. To My First Love.....Lohr

B. Dear Little Girl.....Lohr

Carl Jester

Orchestra: Irene.....Tierney

WGY Instrumental Quartet

Cornet solos: My Regards.....Lewellyn

Theodore F. Nessler

Tenor solos: A. Little Banjo.....Dichmont

B. Mighty Lak a Rose.....Nevin

Mr. Jester

Orchestra: A. Overture, The Calif of Bagdad, Boieldieu

B. Fox Trot, Why Is the Moon Always Shining.....Flynn-St. John

WGY Instrumental Quartet

Cornet solo: My Heart at Thy Sweet Voice, Saint Saens

Mr. Nessler

Tenor solo: Ah, So Pure! "Martha".....Flotow

Mr. Jester

Orchestra: A. Fox Trot, Dancing Fool.....Snyder

B. March, United States Field Artillery.....Souza

WGY Instrumental Quartet

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Radio to Be Big Factor in World Communication

New Transmitting Stations as Well as New Cables Necessary to Meet Steady Demand for Speedy Service

COMMUNICATION systems throughout the world were so generally affected by the World War that the traffic handled on every route in operation after the armistice was greatly in excess of any previous record, says P. E. Nagle, communications expert of the Department of Commerce in the current issue of "Commerce Reports." This increased traffic, he states, is partly due to the suspension of service on such important communication routes as the Indo-European Telegraph Company, the Great Northern Telegraph Company, and the various German and German-Dutch cables, and the officials of American companies were generally of the opinion that with the restoration of service on the routes mentioned there would be a noticeable falling off in the volume of messages handled by American companies. Events, however, according to Mr. Nagle, did not bear out this view, and at the present date, American cable and radio companies are handling more traffic than they ever did except during the war and the two years immediately following armistice.

"The result of this steady growth in traffic has been to keep up the interest in plans for new cables and new radio stations, and every American communication company is now actively engaged in the construction of additional facilities and in plans for new routes and methods for the improvement of operation conditions.

"In the field of radiotelegraphy, the provision of American facilities for communication with foreign countries is dependent to a large extent on the erection of the corresponding stations abroad, and since, with the possible exception of Latin America, radiotelegraphy is a government monopoly in foreign countries, or at least a monopoly of a domestic enterprise, the development of the art in foreign countries and the provision of the requisite funds is a preliminary to any progress in the United States.

"Most of the Latin American republics permit the erection, in their territory, of foreign-owned radio stations for intercontinental work, and, at present, construction work is in progress at Buenos Aires on a high-power transmitting station and its corresponding receiving-station, and on similar units at Rio de Janeiro. In the case of these two countries, the foreign countries involved, American, British, French, and German, have united to build one high-power central station with the units necessary for direct communication with the countries of Europe and North America. It is said that the Buenos Aires station will be completed in another year, and the one at Rio de Janeiro within two years from this date. This service, when established, will form the first direct communication by radio from South America to other continents, although, at the present time, a wireless press service is being received at Buenos Aires from France."

Work Advancing on Atlantic Coast

"The consolidation and coordination of the system of high-power radio stations on the Atlantic Coast is going steadily on, and is keeping pace with the development abroad. Regular radio-service from the United States is now maintained by commercial companies with the Hawaiian Islands, Japan, Norway, the United Kingdom, Germany, and France, and by land wire distribution from many of these countries to points beyond. In addition the United States Naval Communication service is handling commercial traffic to the Philippine Islands, China, Siberia, Siam, Dutch East Indies,

portions of Australasia, and to Italy, and Belgium. Many of these foreign centers receive radio messages from the United States Navy and distribute to points beyond. The Belgian circuit, it should be noted, is a one-way route only, as Belgium has not yet a high-power station capable of transatlantic communication. This commercial service, via naval radio, is temporary, however, since the Navy is authorized to handle commercial radio-traffic only where no private companies have circuits in operation. With the completion of the new Belgian station near Brussels, and the new Italian station at Cultano, the radio traffic will undoubtedly pass into the hands of American commercial-radio companies. The same is true of the projected extension of governmental radio-facilities in the Far East.

"American radio companies are also developing systems of radio communication with Central America, with New Orleans as the main center for American reception and transmission.

"A new high-power station is in course of construction in Poland, another is nearing completion near Christiania, and various others are projected in the smaller European countries. A new high-power station has just been completed at St. Assise, Department of Seine et Marne, France, which is designed to communicate chiefly with the United States, replacing the Lafayette station at Bordeaux. With this station and with those at Christiania and Warsaw, communication will be direct with the United States."

New Cables in Connection with Radio

"In the cable field, cables from New York to Emden, Germany, via the Azores, are planned by two American cable companies. These will restore the routes formerly existing from the United States to Germany, and discontinued as the result of the seizure of the German cables by the Allies during the war. These same two companies are each planning a new Pacific cable, one by way of Hawaii and Midway Island to

Japan, and the other north by way of Alaska and the Aleutian Islands to Siberia and the Orient.

"One of these American companies plans, also, to open its service from the United States to Brazil within the next few months and to extend this service overland and up the West Coast to Panama. Eventually this company will have a complete circuit around the continent of South America. Another American company plans a cable extension along the northern coast of South America touching various ports in Colombia and Venezuela and connecting with the West Indian system of the same company.

"All of these developments and the great improvements they foreshadow in the foreign communications of the United States, are impeded at present by various difficulties such as political considerations in the foreign countries concerned, and obstacles in the form of exclusive concessions held by foreign companies. Steady progress is being made, however, in the solution of these problems, and within the next two years the cable and radio system available for the use of American business interests should be considerably enlarged, and the service decidedly improved."

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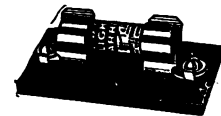
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Mirad Two-Step Amplifier..... 25.00
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COMPLETE RADIO SET

**READY TO
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\$14.50
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**FOR THE COMPLETE
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INCLUDING AERIAL

(Regular price: \$35)

This outfit is intended for the fan that appreciates a good thing. It includes a high grade tuner with a 40 to 80 mile radius, 1200 ohm phone, insulators, and complete aerial set. **SEND NO MONEY** unless you wish. Simply send us your name and address, and we will mail immediately. You pay Postman on arrival, our price, plus postage. Satisfaction guaranteed, or money refunded.

THE UNWIN TRADING CO.
55 BROADWAY NEW YORK

Radio Waves Set 2,500-Ton Train in Motion

AN event which history will record as comparable with George Stephenson's locomotive—when it started its first journey over wooden rails propelled by its own steam, in 1805—took place last week when the International Trade Special, comprising a steam locomotive and thirty-five cars loaded with electrical equipment for the State Railways of Chili, was set in motion by radio waves from KDKA, Westinghouse station, East Pittsburgh, Pennsylvania.

When young George Stephenson started his first locomotive on the Merthyr-Tydvil Railways in South Wales, it hauled several wagons containing ten tons of bar iron at five miles an hour. At once, the intrepid inventor was beset with objections, the principal one being that to permit "such a device to travel at so high a rate of speed would be a menace to life and limbs." For a long time it looked as if steam power was doomed by the narrow-minded. Slow are the footsteps of progress!

Today, 117 years later, a train weighing, with its heavy load, 2,500 tons and measuring a quarter of a mile in length, is set in motion by radio.

The International Trade Special's waybills stated that the freight it carried was valued at \$750,000. When the big locomotive hooked up with the sealed cars, and all was ready for the long journey, the president of the Westinghouse Company closed a switch on a pole about 150 feet from the railroad track on which the train was standing, and one-half mile from the broadcasting station. The closing this switch was communicated to KDKA, causing them to broadcast a special code-signal consisting of a series of dots and dashes. The special radio receiving apparatus set up in the cab of the locomotive, and including an aerial mounted on top of the engine cab, was set to pick up only the special code signal broadcast from the station. When this signal was broadcast, the radio receiving apparatus on the locomotive picked it up and, by means of a selector switch, the control circuits in the locomotive were closed and the train was set in motion and accelerated automatically.

As the train gained in momentum and attained a speed of ten miles an hour, the engineer took his seat in the cab and the big load was moving over its first lap to Chili.

Radio Travels to Mars

EVERY radio wave that leaves a transmitter here on the earth starts out on an endless journey through space, says Raymond Francis Yates in the "Evening Mail Radio Review." Marconi's first message is still sweeping through the ether lanes billions upon billions of miles beyond the earth. It will go on forever. Every ether wave that leaves the earth touches the planet Mars a few months later. By the time an ether wave reaches Mars, however, much of its energy is spent, and it is questionable if the Martians, if they do really exist, have instruments sensitive enough to detect these waves.

A Wonderful Age!

WHAT a wonderful age we live in! exclaims "The American," New York. An American concern has just been awarded a contract for the construction of a two-million-dollar wireless station in Sweden. This powerful new plant will be a link in the chain of wireless stations which will eventually encircle the world.

An Italian developed the wireless for the world. An American concern will first send a message by it around the world.

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Why Alternating Current Is Used

IF you use a small spark-coil it will be necessary to have about four dry cells or a storage battery of 60 ampere-hours capacity. Larger coils could use a larger battery. The voltage to be used varies with the particular coil, but generally ranges from six to twelve.

If you use a transformer, you must connect it with your alternating current supply line, which is usually either 110 or 220 volts. Be sure and find out the line voltage, and get a transformer to suit. Also, be sure that you have alternating current, as otherwise your transformer, or possibly the line wiring, would burn out. A one-half kilowatt transformer draws from three to four amperes of current.

The current for transformers up to one-half kilowatt may be supplied from a lamp socket, but transformers of higher power should have special wiring.

Condensers for transmission on a wave-length of 200 metres should not exceed a capacity of .01 microfarad. Leyden jars, as used on commercial sets, have a capacity of .002 mfd., and five of these connected in parallel would give a value of .01 mfd.

The primary of the oscillation transformer should have about four or five turns, and the secondary should have about ten or twelve turns.

With a quarter kilowatt set, the antennae ammeter should have a maximum scale reading of about three amperes.

Other powers should have meter readings in proportion.

The rotary gap rotor should have from four to twelve electrodes, this depending on the speed of the motor and the tone desired.

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A 500-Mile Radiophone Employing a 5-Watt Tube, by Frank A. Hahnel.
"Tell Me, Please, How Will This Set Receive?" by E. L. Bragdon.
Short Cuts in Receiver-Circuit Design, by O. C. Roos.
Making a Short-Wave Regenerator, by Fred Chas. Ehlert.

APRIL 8.

Do You Know Your Receiving Equipment, by James D. Gordon.
Why a Crystal Is Called a Rectifier, by Walter Emmett.
Is Radiotelephony Dependable? by O. C. Roos.
Mounting Crystals in Your Detector, by E. L. Bragdon.
Storage Batteries for Radio, by Fred Chas. Ehlert.

APRIL 15.

First Principles of Electricity as Applied to Radio, by John P. Miles.
Your Storage Battery, by E. L. Bragdon.
What Makes Radio Possible, by Edward Linwood.
Ground-Connection as Vital as Antenna, by Fred Chas. Ehlert.

APRIL 29.

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What Is Meant by Tuning, by E. L. Bragdon.
Radio-Frequency Amplification and Regeneration, by Frank Armstrong.
Honey-Comb Coils and Condensers, by Edward Linwood.
Charging the Storage Battery, by E. L. Bragdon.
How to Construct the Variocoupler, by Frederick J. Rumford.

MAY 6.

The Advantages of Radio Frequency, by Harold S. Potter.
How to Construct, Protect and Operate a Storage Battery, by George W. May.
The Beginner's Catechism, by Edward Linwood.
Tuning and What Is Meant by It, by Fred Chas. Ehlert.
New Frequency Amplifier Brings Faintest Waves in Strong, by G. W. May.

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The Principles of Radiotelegraphy, by Walter J. Howell.
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Radio Terms at a Glance, by Fred Chas. Ehlert.
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MAY 27.

The Beginner's Catechism, by Edward Linwood.
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Why the Condenser Doesn't Condense, by E. L. Bragdon.
Making Signals Louder with Two-Stage Amplifier, by George W. May.

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Tested Invention of Major Armstrong Amplifies Set 100,000 Times, by John Kent.
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latest issue of the Radio Service Bulletin and will be continued if found of service to the readers of the Government publication.

The lists cover subjects of importance and interest to the more advanced radio enthusiasts and include not only American publications but also those published in

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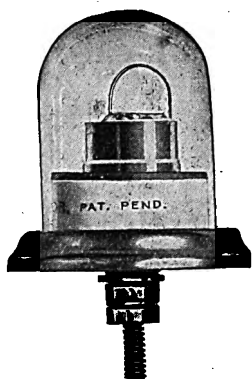
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Not So Easy to Win "The Blue Ticket"

WHILE studying theory and while
getting your set in condition for
operation, you can still keep up your
code practice, and gain proficiency, says
"The Globe," New York. It is the same
with code as with music; you have to
keep in continual practice. Even after
you have gained considerable speed, you
must keep up your practice, or else you
will grow "stale," and lose some of your
ability to copy messages.

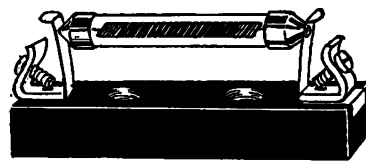
Not only must the characters of the
alphabet be known, but also a number of
the conventional signs and "Q" signals.
You must also know how to send a mes-
sage in proper form.

So the radio enthusiast who desires
to install and operate a set of apparat-
us for voice transmission only, the regu-
lations requiring a knowledge of the
code may seem foolish—and to a certain
extent they are foolish. Eventually a
fairly thorough technical knowledge, and
a sufficient knowledge of the code to
recognize distress signals and "keep-out"
signals, will be all that is necessary to com-
ply with the requirements to operate a
radiophone sending station.

Probably the first thing that you will
try for is the amateur first-grade license,
or "blue ticket." As far as code is con-
cerned, this means that you will have
to copy at least ten words a minute (five
letters to a word), and you must copy at
least fifty letters in their consecutive
order. The grades of Commercial Sec-
ond, and Commercial First, require code
speeds of twelve and twenty words a
minute, respectively.

The technical examination covers the
adjustment and operation of the particu-
lar set that you intend to use. A dia-
gram is necessary, and you will be re-
quired to explain the different parts.

Examinations may be taken at various
navy yards, and by appointment with the
radio inspection of your particular dis-
trict. A list of these is contained in the
Radio Communication Laws of the
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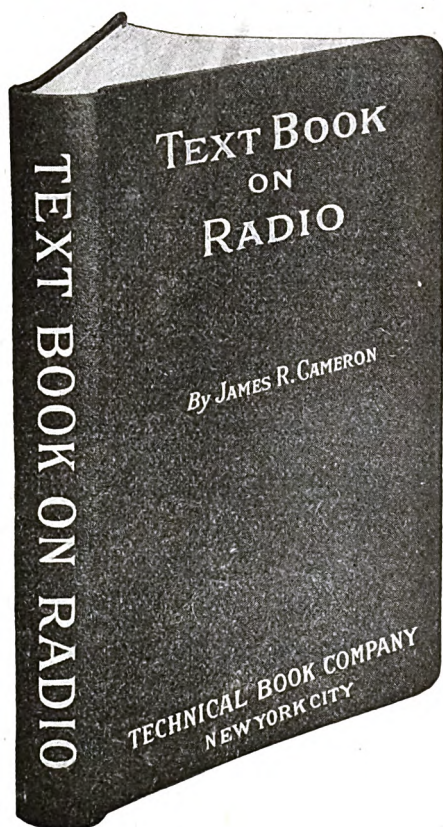
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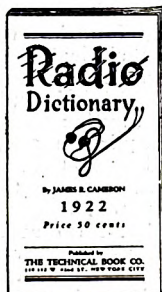
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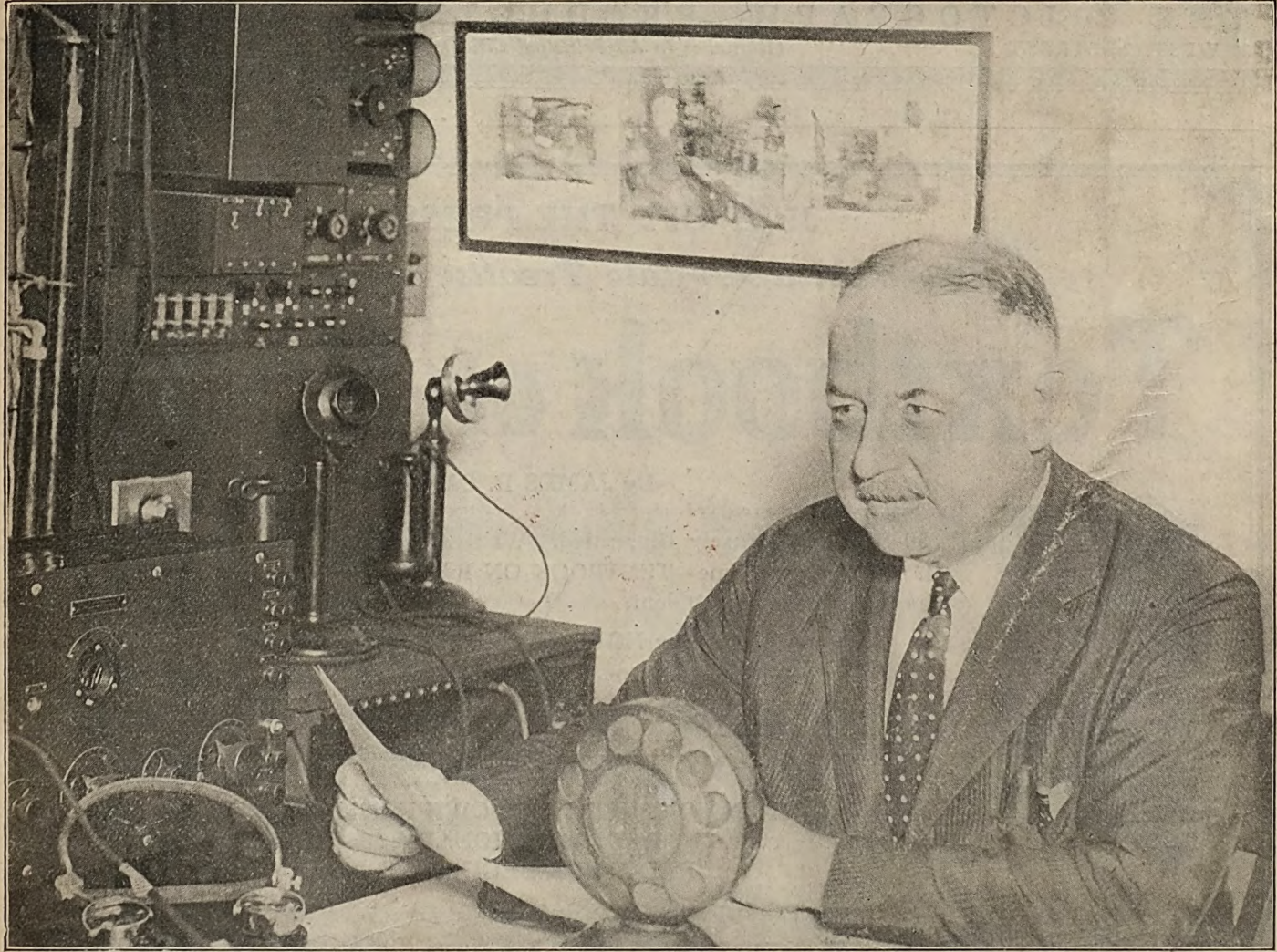
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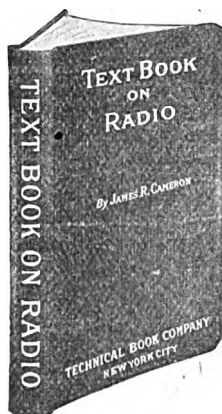
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RADIO WORLD

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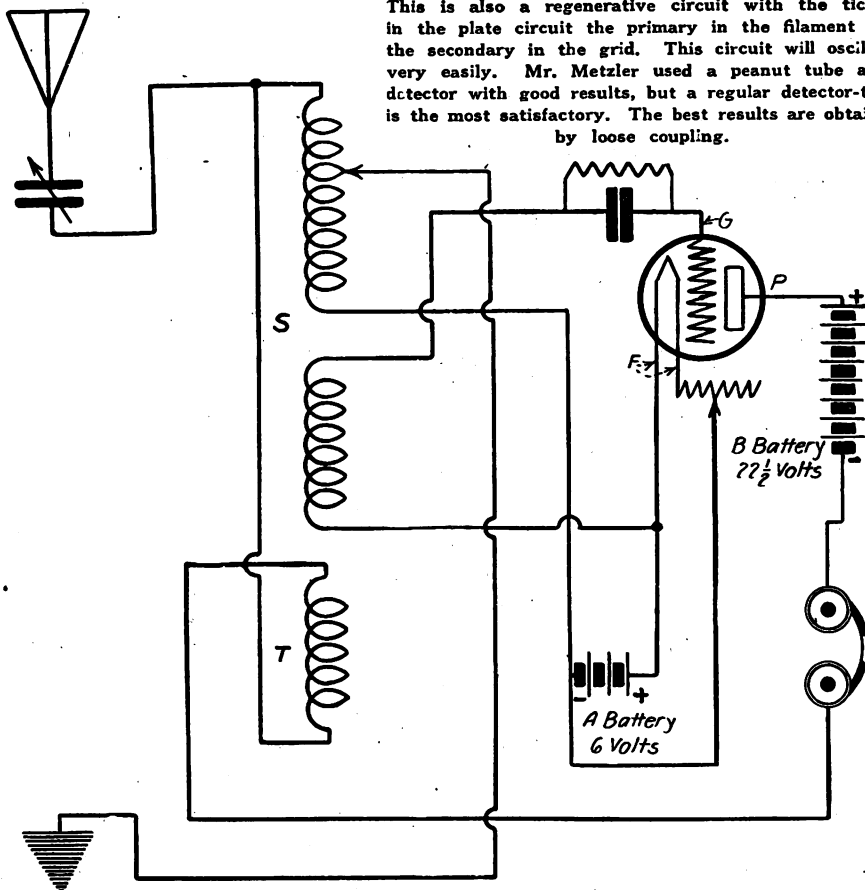
New V-T Hook-up Worth Testing Out

FELLOW amateurs! If you like to experiment with different circuits, try this one and feel a sense of satisfaction creep over you when you get to the point where you are ready to turn the rheostat knob to light the filament.

The accompanying sketch explains itself. There is but one thing I wish to say regarding it. Try the hook-up as the sketch shows, then, if you care to, go further.

Take the wire from the end of the tickler coil that connects with the aerial and connect it on the top switch of the primary coil. In this circuit, I use a loose coupler, and for the tickler, I use a coil which will fit snugly inside the secondary coil so it will slide in and out as does the secondary. Be sure that all coils are wound in the same direction. I have my primary wound with about 160 turns of No. 22 S-C-C wire tapped every 10 turns for the first 60 turns, then every 20 turns. The secondary has a like number of turns and the same size of wire, but is not tapped. The tickler has No. 24 wire and about 110 turns, and is not tapped. You will find the tickler coil in this circuit very sensitive and affording sharp tuning. I have never been bothered with a spark station when using this outfit.

By P. F. Metzler



This is also a regenerative circuit with the tickler in the plate circuit the primary in the filament and the secondary in the grid. This circuit will oscillate very easily. Mr. Metzler used a peanut tube as a detector with good results, but a regular detector-tube is the most satisfactory. The best results are obtained by loose coupling.

Latest Important Radio News of the Week

Two new radio stations will be erected in Manitoba, Canada, for the purpose of facilitating forest-fire control.

* * *

"The Valiant," a one-act play by Robert Middlemass, has been chosen by Joseph Santley for his experiment of broadcasting a drama by radio on Sunday evening, September 24, Mr. Santley will have the assistance of Ivy Sawyer. The event will be held under the auspices of the Equity Players, Inc.

* * *

Clerks in all offices of the Postal-Telegraph Cable Company are authorized to accept, for wireless transmission, all messages marked "via radio."

* * *

Arrangements are being made by the Crosley Manufacturing Company, Cincinnati, operators of the radio station WLW, to broadcast church services every Sunday morning.

* * *

The bid of the Western Electric Company to build the broadcasting station for New York City, will be considered at the next meeting of the Board of Estimate. The Western Electric bid was for \$24,500.

A vacuum tube capable of supplying 100,000 watts, or 200 times the power required for the ordinary radio broadcasting station of 100-mile range, has been developed in the Bell Telephone system laboratories of the Western Electric Company.

* * *

The efficacy of radio was demonstrated in the West Side Court, New York City, when a call was sent out from the broadcasting station at Police Headquarters by Fingerprint Expert William Beirns. The call was heard by his assistant, William McCue, who maintains a receiving set at his home at Neck Road, Sheephead Bay. McCue rushed to the Fifty-fourth Street Station for important duty.

* * *

The "Manchuria," of the American Line, left New York equipped with a new radio device intended to guide vessels into and out of the harbor in time of dense fog. A test, made leaving New York harbor, was said to be satisfactory. The device consists of a cable containing seven conductor wires, submerged in the channel from Ambrose Light to the upper bay. Sensitive wires over the sides of the vessel trailed in the water, and were so "tuned" that when the ship was directly over the submerged cable buzzing sounds were registered in a box on the ship's bridge.

New Method for Lighting Filaments

By C. White, Associate A. I. E. E.

THE pleasure we derive from a certain scientific or mechanical device does not altogether depend on the initial cost of the affair, but, rather, on the cost of maintenance. Owners of automobiles attest the veracity of this statement. Therefore, an attempt to reduce the cost of upkeep is certainly a step in the right direction. Radio amateurs have long been waiting for some sort of a device that would remove the trouble and care attending the lighting of filaments of their tubes. Since most houses that are wired for electric lights have a supply of alternating current of sixty-cycles frequency, the main problem has been to adapt such current to the work. Of course, the use of toy transformers to step the voltage down to that recommended for the tubes has been often tried, but the whole method failed because a strong 60-cycle hum was heard in the phones. The problem then became one of getting rid of this hum to the best

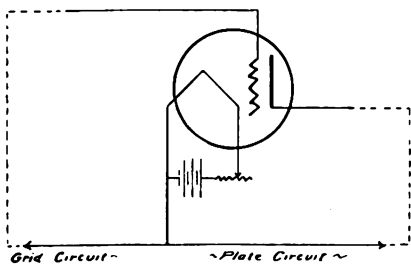


Fig. 1. Schematic diagram of the general hook-up of a vacuum-tube in a dissecting circuit. Drawn by C. White.

economical advantage. Filters are satisfactory scientifically, but, owing to their cost, are not economical in comparison with the old storage A-battery.

It was not until very recently that Dr. P. D. Lowell, of the United States Bureau of Standards, developed a thoroughly sound method. In this article, I shall endeavor to explain how his method may be adapted readily to any A battery circuit.

In Figure 1, the general hook-up of a vacuum tube in a detecting circuit is illustrated. For the sake of simplicity, the details of the tuning and plate circuits are represented by dotted lines. Now, the average amateur who uses bulbs has this type of wiring, and in order to change over to the new method, he must make connections similar to those shown in Figure 2.

From these two illustrations he can get the general idea of the alterations that must be made. First, the 110-volts A-C supply must be stepped down by a small toy-transformer with variable secondary voltage taps, such as 4 volts, 6 volts, 8 volts, and so on. These transformers may be purchased at any

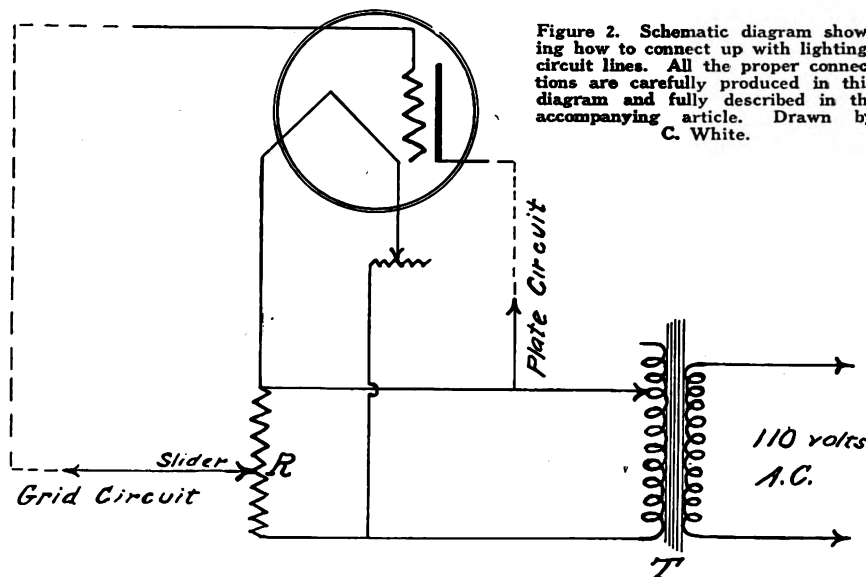


Figure 2. Schematic diagram showing how to connect up with lighting-circuit lines. All the proper connections are carefully produced in this diagram and fully described in the accompanying article. Drawn by C. White.

electrical or toy store. If the novice so desires he can buy a bell-ringing transformer having a 6-volt secondary tap only; but under such circumstances it is impossible to alter the voltage applied to the tube in case the supply voltage should rise or fall. The resistance, R, should have a value ranging from 200 to 220 ohms with a slider in the middle.

It is not an easy matter, however, to obtain such an unit complete, but the amateur can readily make up this unit separately. From any electrical supply-store, he can purchase two resistance units of 100 ohms each and a porcelain-base rheostat with a slider having a resistance of 10 ohms. The 100-ohms resistances may be purchased, mounted in standard Edison screw-bases and must be mounted in a standard incandescent-lamp socket. The three resistances are connected in series with the rheostat, in the middle and the two 100-ohm units on the outside. Therefore, by moving the slider a variation of 10 ohms may be made in the balancing point. If another tube is

to be employed, then it is necessary to use another unit, R. In fact, the number of tubes and the number of balancing resistances must be the same. All the tubes may be supplied from one transformer, T, so long as the transformer-current rating is not exceeded.

If this method is employed, it is recommended that a grid leak of two megohms and a condenser of 0.002 mfd., is used instead of the size at present on the receiver. The slider is to be adjusted until the minimum 60-cycle hum is heard in the phones. The brilliancy of the filament may be adjusted by the taps on the transformer and, finally, by the usual filament-control rheostat. Although there is always present a 60-cycle hum, it is possible to so adjust the set that this hum is almost inaudible. Small variations in the house-supply voltage will not materially alter the proper functioning of the apparatus.

In conclusion, I would like to call attention to the fact that this method of lighting filaments is not only easy to install but exceedingly efficient and economical in operation. There is no heavy, soiled storage battery to be carried and recharged; there is no charging set to be purchased; and, last but not least, your outfit is ready for operation at any time current supply is in your house, no waiting until the battery is charged or other such delays. Then again, the cost of the whole affair will not exceed the cost of one good storage A battery. Since the cost of operation is mainly dependent on the maintenance of the A battery, because the B battery needs practically no attention and lasts a long while, this method will be found to almost make the large vacuum-tube sets as easy from the upkeep point as a crystal detector.

Call Letters of Air-Mail Radio Stations

FOR the information of radio users the United States Postoffice Department has announced the call letters of all the radio stations used for air-mail postoffice business and broadcasting. The stations and their letters are as follows:

Washington, WWX; Hazelhurst, WWU; Bellefonte, WWQ; Cleveland, NRH; Chicago, NAJ; Iowa City, KDTS; Bryan, Ohio, KDEL; Omaha, KDEF; North Platte, KDHM; Cheyenne, KDEG; Rock Springs, KDHN; Salt Lake, KDEH; Elko, KDEJ; Reno, KDEK; San Francisco, NPG.

The department states that amateurs can receive market and weather reports sent out from the Postoffice Department stations.

Complete Table of Symbols Used in Radio Reception and Transmission

AERIAL	VARIOMETER	GROUND	VACUUM TUBE	COIL OF INDUCTANCE
2-CIRCUIT JACK	VARIABLE COIL	FIXED CONDENSER	VARIABLE CONDENSER	CONDENSER WITH GRID LEAK
PHONES	CRYSTAL DETECTOR	RHEOSTAT	AUDIO AMPLIFYING TRANSFORMER	JOINED WIRES
CROSSED WIRES	AIR CORE TRANSF.	B BATTERY	A BATTERY	VARIOCOUPLER

Here is a table of radio symbols that every amateur will want to keep. As a ready reference it will be well to have this at your elbow. The experimenter will need it when he is wiring up any part of his set. The man who studies hook-ups will find it invaluable. These are all the symbols used in every phase of radiotelegraphy and radiotelephony. They have been compiled with great care by the Technical Editor of Radio World. The drawings are by S. Newman.

THE ordinary form of radio-frequency amplification by means of the cascade system is still in an experimental stage, so far as short waves are concerned. Experts have refused consistently to advise its installation, except for the purposes of experimentation. If the amateur desires to use it for experimental work only, it is perfectly all right, but if he wishes to use it in order to give steady performance with broadcast entertainment results will be as well as might be expected.

* * *

Whenever in reception over a considerable distance one observes a variation in the intensity of the signals it is most likely due to so-called "fading," caused by some obstruction to the traveling waves somewhere between the two stations, and

Hints for Fans

not to any fault of the transmitting station itself. These effects are much more frequent in the summer than in the winter season, presumably because of the greater influence of the sun on the earth and its atmosphere during that season. The transoceanic radio stations must be equipped with high-power apparatus in order to work through bad periods, although at certain times less power may be used, as is evidenced by the successful transatlantic transmission by low power stations during the winter months.

* * *

In all radio-frequency amplifying circuits it is absolutely necessary that a potentiometer be used across

the A battery which lights the filaments of the tubes. This stabilizes the entire circuit and enables the operator to put the proper amount of negative on the grids of the radio-frequency tubes. This function will be further assisted by placing a bypass condenser of at least .001 mfd. capacity across the grid lead and negative side of the potentiometer. One potentiometer and condenser may be used for all radio-frequency amplifying stages used in such a set. While it is possible to use a regenerative circuit in connection with radio-frequency amplification, this is not advised because it only adds to the difficulty of adjusting and balancing the receiver. It must not be forgotten that on short waves the phenomenon of regeneration is actually present in radio-frequency amplification.

First Police-Department Broadcaster for New York City

By Peter Gray

ON Saturday of last week, the Department of Greater New York began the operation of a radio-broadcasting station of the most modern type, to cover a radius of 30,000 square miles and to be used entirely in police routine. Within a few months, police boats and police-inspection headquarters will be equipped with receiving sets and New York City will be the most up-to-date radio-equipped city in the world so far as police-department work is concerned. Through Herbert R. Hoover, Secretary of Commerce, special permission has been granted to New York City to operate on a special wave-length of 400 meters—a band not allocated to any other municipality. This was done so there will be as little interference as possible in the police broadcasting.

The apparatus is of the same general type as that by which communication was carried on early this year between Deal Beach, N. J., and the steamer "America," when it was over 500 miles from land. The new New

York police broadcaster was used for the first time Tuesday, September 12, to broadcast the speeches given at the organization meeting of the National Police Conference at the Chamber of Commerce, and on Thursday night it "shot" into the ether the speeches of the annual National Police Conference dinner at the Waldorf-Astoria.

Joseph A. Faurot, Deputy Commissioner in charge of the New York police executive departments says:

"If what Mr. Evans, the Western Electric engineer who is instructing our operators in the use of the equipment, states is true, the Police Department will be able, without any difficulty, to cover an area of at least thirty thousand square miles. This should prove a great advantage in running down stolen automobiles, locating missing persons, spreading alarms, and in all other work where secrecy is not an essential factor.

Every amateur receiving station in a radius of at least one hundred miles from the city will become a police outpost, enabling us to spread emergency information at a much quicker rate than is now possible. As our men gain more experience with the transmissions of radiotelephonic information, it is very likely that we may even use the ether to spread confidential reports. It would not be very difficult to prepare a special code for such purposes."

M. R. Brennan, Superintendent of the Police Telegraph Division, was mainly influential in clearing the way for the installation of the station.

Secretary Hoover, who recalled how the New York department was the first to make a success of radiotelegraphy in police work some years ago, was quick to realize New York City's position and authorized a 400-meter wave-length. Later, if it becomes necessary for the Department of Commerce to allow wider scope to any of the present users of the 360-meter wave-length, it has been agreed that the New York City Police Department may widen its range to 500 meters.

A vest-pocket telephone apparatus which can be quickly attached to the nearest telephone wire, putting the possessor in immediate communication with headquarters, is being demonstrated to Police Commissioner Enright by its inventor, William Wallace MacFarlane, of Elkins Park, Pa., president of the American Moving Train Telephone Company. He hopes to have every policeman equipped with one of his instruments, claiming this can be done at a cost of 75 cents each and will render unnecessary the present police telephone boxes.

When other large cities adopt radio for administrative purposes, it will be possible to establish a network of broadcasting and receiving stations through which a national alarm may be given instantaneously.



(C. Central News Photo Service)

This is a 500-watt radio broadcasting-set, consisting of two 250-watt tubes which operate on 1600-volts plate-circuit, has three-wire microphone transmitter and specially designed three-stage speech amplifier for converting speech into electric current for use in the radio transmitter. To furnish the necessary voltages, a three-unit motor-generator set and battery are placed in a separate power room. The equipment also includes a radio receiver consisting of two stages of radio-frequency amplification, a detector and one-stage of speech-frequency amplification. The antenna is of the T type, 92 feet long and 75 feet above the roof. A special panel is provided for controlling the voltages and currents used by the radio transmitter. Six meters are provided for indicating the antenna current oscillator and modulator plate-current, grid current, filament, and plate voltages. The radio transmitter is controlled by two dials, one marked "Frequency" for controlling the wave length and the other marked "Oscillator Adjustment" for controlling the oscillator plate-currents. Fifth Deputy Police Commissioner Joseph A. Faurot is shown in the photograph on our front cover broadcasting the first speech to be sent over the new set.

Four Soldering Points

THERE are four points to be remembered when making up a soldered joint. First, the surface of the parts that are being joined should be cleaned and polished; second, the surfaces should be treated with a soldering flux; third, the temperature of the soldering iron should be kept at the right heat; fourth, the metal parts should be heated with the iron and just enough solder applied to cover the parts neatly.

New Water-Cooled Vacuum Tube Develops 100 Kilowatts

WASHINGTON, D. C.—A supervacuum transmitting-tube, which brings this country again to the fore in radio development, has just been perfected by the Bell System Research Laboratories. It is a 100-kilowatt water-cooled tube and takes precedence over all the vacuum tubes perfected during the past few years which depended on thermal radiation and were limited, therefore, in output to from 1 to 5 kilowatts, when used as an oscillator. Engineers of the American Telephone and Telegraph Company have even surpassed the tube recently brought out by Professor Irving Langmuir of the General Electric Company, capable of delivering 20 kilowatts of high-frequency current and also water-cooled.

Although the A. T. & T. officials will make no predictions as to the future uses or practical applications of the new tube—the largest in the world—they should now be able to transmit code messages around the world from WBAT with two such tubes in parallel, and it is probable that with two or four tubes the human voice could be sent across the Atlantic Ocean. Ten of the Langmuir tubes in parallel, it has been estimated, would be required for transoceanic communication.

Besides the high power of the tube, great economies in eliminating equipment, saving both space and cost, are promised when the hundred-kilowatt tubes become commercialized. Uninterrupted long-distance communication is assured, in the near future, due chiefly to the method of cooling this high-powered tube.

Development of Transmitters

The art of radio transmission has developed from spark sets to arc sets, thence to alternators recently perfected, finally to tubes which are daily in process of development and perfection. Some of the larger broadcasting stations employ two or more tubes of the 250-watt type and it is a common occurrence for their broadcasts of music and voice to be heard a thousand miles. The voice does not carry as well as telegraph signals and, therefore, for telegraph work two of the new 100-kilowatt tubes, 200 times the strength of the 250-watt tubes, and five times the size of the Langmuir tubes, should carry half way round the world which, it is believed, is the ultimate need for transmission.

"The development of wireless telephone and the use of continuous-wave transmission in wireless telegraphy have led to the general adoption of the

By Carl H. Butman

vacuum tube as the generator of high frequency currents in low-power installations," says Dr. W. Wilson in describing the recently made tubes. The ordinary vacuum tube is unsuited for handling large amounts of power, he points out, and, to-day, at large radio stations where the plants are rated in hundreds of kilowatts, either the arc or the high-frequency alternator is used. The development of radiotelephony called for more powerful tubes in proportion to the power of the big stations, and for years the research men of the Bell System have been working on the problem. When Arlington Radio Station, NAA, first bridged the Atlantic and Pacific Oceans with a spoken message, some time ago, 300 tubes of 25 watts each were used in parallel—which was difficult of operation.

Need for Kilowatt Tubes

Kilowatt tubes were needed in place of tubes measured in watts. The multiple of 1,000 was a stumbling block as were other phases of the problem. The elimination of the heat developed was the big problem; but the idea of cooling the anode by the passage of water—somewhat as the barrel of a machine gun is cooled by a water jacket—was finally hit upon. Dr. E. R. Stoekle and Dr. O. E. Buckley, with assistants, finally developed an experimental tube cooled by water which developed 10 kilowatts. They were later aided by W. G. Housekeeper and Dr. M. J. Kelly, the former working on the

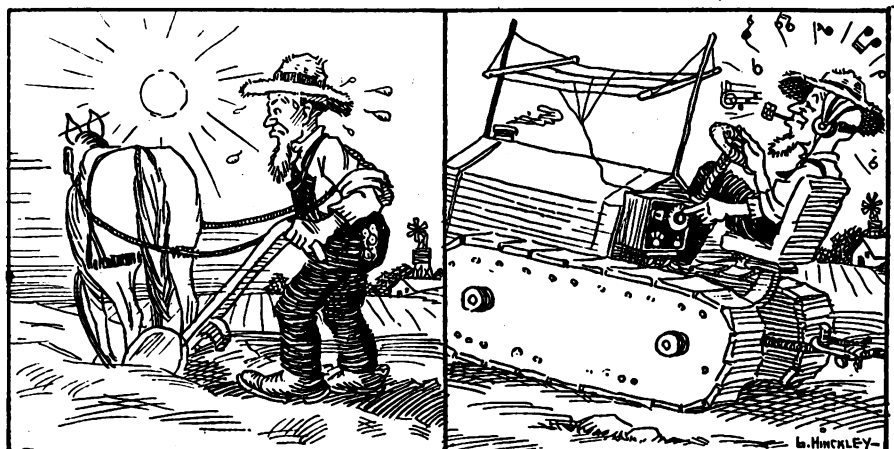
mechanical structure and the latter determining the electrical design and process of tube exhaust. It was Mr. Housekeeper who developed the vacuum seal for closing the metallic and glass portions of the tube, so that it would withstand repeated heating and cooling varying from the cold of liquid air to a temperature of 350 degrees, without cracking or breaking the vacuum. This he did, perfecting the ribbon, disc, and tube-seals for joining copper and glass by a sort of welding process.

The Big Tube Weighs Ten Pounds

The big tube is a little less than 2 feet in length and weighs only 10 pounds, yet it is capable of developing 100 kilowatts high-frequency energy, applicable to both radiotelegraphy and radiotelephony. "These 100-kilowatt tubes," an official of the telephone company states, "by no means represent the largest tube made possible by the present development. There is no doubt that if the demand should occur for tubes capable of handling much larger amounts of power, they could be constructed along the same lines."

The anode, which is made of a piece of seamless copper tubing closed by a copper disc welded into the end, is 14 inches long and 3.5 inches in diameter. The filament is of tungsten and is .06 inch in diameter and 63.5 inches long. The current required to heat it is 91 amperes and the power consumed in it 6 kilowatts. The filament leads are of copper rod $\frac{1}{8}$ inch in diameter and are sealed through 1-inch copper-disc seals. The grid is of molybdenum and is wound around three molybdenum supports.

Farm Life Isn't What It Used To Be



AS IT WAS: "Gaddap, Dynamite! Crass your measly hide."

AS IT IS: KYZ is sending some fox-trot to-day, by heck!"

(Cartoon by L. B. Hinckley)

Why the Radio Compass Is the Fighting Element of Science

By Ortherus Gordon

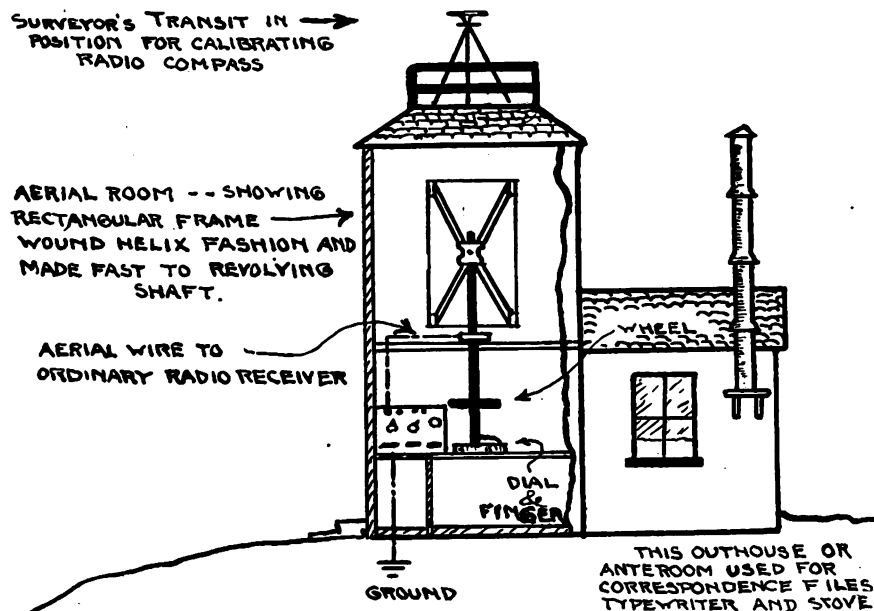


Figure 1—The standard construction of a Navy radio-compass station and the arrangement of the instruments within.

THE radio compass was first used to any great extent in the World War, when there were established at hundreds of points along the active front, little, miserable "gonio stations" so-called because the instrument used was technically known as goniometer. It has since become known as the radio compass—because it points the way. The men at the gonio stations during the World War may have had to stand up to their knees in mud or up to their waists in water—for I have an idea they were not behind-the-line fighters—but they caught signals and determined the direction the signals were coming from, much to the satisfaction of the Intelligence Department.

At the same time, United States Navy transports were being equipped with these direction finders. Warships appeared with a new device on the bridge—a huge cylindrical box containing a helixlike antenna—and with this device the presence and compass bearing of enemy ships were detected. The warship then turned its nose toward the ship, steamed at full tilt with double lookouts, and found the enemy—or didn't—according to whether it had the right lead. For it is unfortunate that the radio compass, in its present stage of development, does not indicate the traveling direction of the waves it intercepts. It indicates the bearing, of the plane in which these waves are traveling, and leaves it up to the judgment of the operator as to direction.

This weakness, however, is not as important as it may seem. When the officers of United States ships first thought of using the direction finder to take bearings of lighthouses and light-vessels, and find their way into a fog-besieged port, they never doubted that the radio station in question was off the starboard bow and not off the port quarter. The radio compass had enlisted common sense in its cause; and in the same manner that the gonio stations determined the enemy stations to be somewhere on the other side of Norman's Land and not behind them at headquarters, navigators determined that the land stations were in the general direction of the continent ahead and not out on the ocean behind.

Gradually, the use of the radio compass to fight fog came into common use among navigators who were fortunate to be shipmates with a goniometer. They used it because, on many occasions, it proved itself an accurate check on the ordinary methods of navigation—and often, when those methods were not available, a dependable substitute. The United States Navy Department was quick to realize that if this new weapon was to be of any benefit to seamen the radio-compass stations must be on land and in houses especially designated for that purpose; for it was too much to expect a cargo vessel to carry and to care for such an instrument as the goniometer. As a result of this realization, our coast line near our important harbors is dotted with "R. C.'s," as they are

called on the pilot charts, from which a captain at sea may obtain a series of bearings and thus find his way into safe waters through the thickest fog.

The goniometer isn't complicated or difficult to operate, as a peek into any one of the R. C.'s on the Atlantic Coast will show. It is exacting, however, for the work which the radio operators are called on to do is of the utmost importance. Carelessness on their part may send a ship piling up on a rocky beach—and incompetency will keep a ship floundering off-shore when she might just as well be in the harbor and at her dock. The radio-compass stations, for this reason, are comfortable and cheerful, and designed to give proper rest and relaxation to the men who guide navigators through blinding elements.

The operating room may be only eight by eight feet and a little higher than a man, for the lineup of instruments is small enough to rest upon a very small table. There is an ordinary radio-receiving apparatus with the usual detector bulb and amplifiers, connected with aerial and ground in the usual way. Ordinarily there is no transmitting apparatus, for only one out of a number of radio-compass stations has any call to communicate with ships at sea. That one is known as the control station, and is the one with which the operator at sea has his dealings. There is a telegraph key, however, and, perhaps, a telephone, both in the system of intercommunication which is maintained between the control station and the R. C.'s of its group. In some cases, there is a small low-powered spart-transmitter, used when the land lines are out of commission, but never for direct communication with stations asking for bearings.

The only strange apparatus in the room is a vertical shaft leading up through the ceiling to an eight by eight by another eight on the second floor. This shaft is connected to the radio-compass aerial, like the handle of a fan, so that when the shaft is revolved by means of a wheel within reach of the operator, the aerial revolves as well. Below the wheel is a graduated dial, the reading of which shows by comparison with a fixed dial, the direction in which the axis of the aerial is pointing with reference to true north. And the direction in which the axis of a radio-compass aerial is pointing when the signals of

(Continued from preceding page)

a station are least audible in the radio receiver, is the bearing of that station from the goniometer.

The aerial is not of the usual construction at all; but is wound on a frame like a helix, with each of its component wirings the exact length of a similar component. It is rectangular in shape and can be about four feet by six. It needs little attention after installation, as it is most always enclosed in a room or circular compartment by itself. It must, however, revolve in a true vertical posi-

this screening is self-evident to radio men: to intercept radio waves that might otherwise reach the instruments within the room and distort or confuse the exact point at which the signals are at a minimum.

The man at sea, in the meantime, has no idea of the amount of care that enters into the granting of his request for a set of bearings. Nor is he aware of the number of simultaneous actions that must take place in a number of isolated buildings miles distant from each other and on the part of a number of individuals. Anyone who has

want a position, and they want it in a hurry. There are often waiting lists at the control stations—lists that never diminish; for a navigator demands a bearing, not once a day, or once a watch, but every thirty minutes!

The control station handles it all. Let us assume that a steamer, somewhere off Cape May, wants radio bearings. She doesn't choose the R. C.'s best situated to serve her, but calls the nearest control station in the usual manner and on the usual commercial wave-length. Before receiving an acknowledgment, in fact, at the same time as she calls the station, she sends the signals Q T E, meaning, "What is my true bearing?" The answer is an order to stand by until other vessels are served, or to send immediately her radio call for thirty seconds, a continuous series of test signals, and her call again for one minute. In the meantime, assuming that prompt service is available, the control station has telegraphed the R. C.'s in the proper group to catch the bearing of the steamer as she sends during the next three-minute period. The "catching" takes place, and the R. C.'s telegraph their report to the control station, which makes up a message and sends it to the fog-bound steamer, whose operator acknowledges it by repeating the bearings given, and then hotfoots it to the bridge, where the skipper is impatiently waiting. The message reads:

Q T E (your true bearing from) Cape May, three hundred and ten degrees; Cape Henlopen, two hundred and eighty degrees; Bethany Beach, two hundred twenty-five.

The skipper takes these three bearings into the chartroom and plots them on the chart with the aid of the parallel ruler and compass rose. He finds that they meet, or nearly meet, at a common point somewhere off shore, and that point is the position of his vessel at the time the bearings were taken. If they form a small triangle, the vessel is in its center.

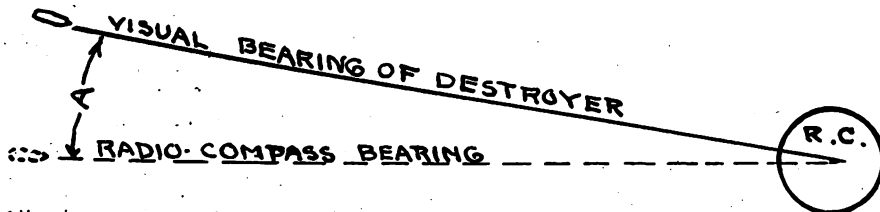


Figure 2—It is all very simple. "A" is the exact position of the vessel located by radio-compass.

tion else the accuracy of the bearings will be impaired.

The radio-compass is subject to the same local deviation as a magnetic compass, although from different causes. The natural barriers and obstructions which tend to distort the direction of radio waves make an uncalibrated radio-compass a positive menace; so, frequently, there must be taken for the determination of these distortions, a series of simultaneous bearings throughout the active arc of the radio-compass station. This is done in the same manner in which a navigator determines the deviation of his magnetic compass. A destroyer or any other vessel with a wireless transmitter, stands away from the compass station and sends a series of dashes continuously. The operator notes the bearings of these signals by the goniometer as the destroyer circles about the station, and, at the same time, an observer on the roof of the aerial house takes simultaneous bearings with a surveyor's transit. The bearings are taken for, perhaps, every half-point on the compass card, and when compared give the error of the radio-compass on each and every direction it may be called on to determine. The deviation card, thus made up, is always at hand.

A curious although perfectly natural fact about these errors is that it is not the same on all bearings. No R. C., for example, has an unvarying correction of 5 degrees east, or 3 degrees west, but has, say, an error of 1 degree on a bearing of 45 degrees, and of 15 degrees on its reciprocal of 225 degrees.

The accuracy of compass reports is safeguarded in still another way. The entire operating room is screened on all sides by bronze screen wire, the walls, floor, and ceiling, and even the windows and doors. The purpose of

tried to get human beings to work in any sort of successful cooperation will understand what this means. And the demand for radio bearings is like the demand for fireworks—it comes all at once at a specific and predetermined time. For days, let us suppose, the radio-compass stations have been doing nothing. The weather is clear and fine, and but for an occasional request from a timid skipper who wants to try out "the newfangled idea" in clear weather before he'll trust it in a fog, the R. C.'s are idle.

But a mist at evening followed by a heavy fog. From out of nowhere, seemingly, come endless calls for radio bearings. Insistent calls from all classes of ships—from the ocean liner off the Banks, the semi-passenger and freight vessel of the South American trade struggling with the Gulf Stream, and the freighter, tanker, and fishing vessel coming up coast from the South.

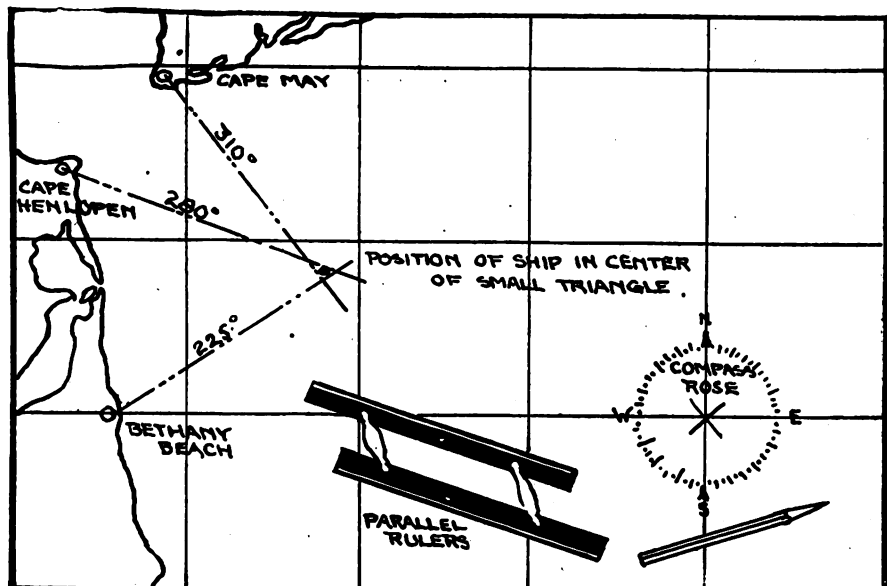


Figure 3—Nowadays all that a navigator needs is a chart, a pair of parallel rulers and a pencil, and with the aid of radio bearings, he is able to plot his exact position in relation to two or more points on land.

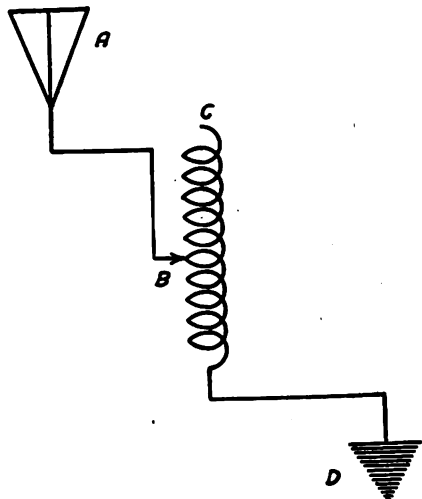
The Radio Primer

A Weekly A. B. C. of Radio for the Beginner, in which Elementary Facts and Principles Are Fully and Tersely Explained and all Words and Terms Used by Amateurs and Experts Defined

By Edward Linwood

HOW can the primary of a vario-coupler be determined in a diagram. Should this be drawn the same way in all diagrams?

The primary of a vario-coupler, loose coupler, or tuning coil is always determined and drawn in all circuits according to the accompanying sche-



Schematic design of aerial, primary coil and connection.

matic design. A represents the aerial, and B the variable connection from aerial to one side of the primary coil. C is the primary coil and D the connection from the other side of primary coil to the ground.

* * *

How are the secondary windings of power transformers connected?

The secondary windings are connected in series with a terminal at the junction so that the two rectifying tubes may be used simultaneously thereby utilizing both halves of the alternating current and voltage waves.

* * *

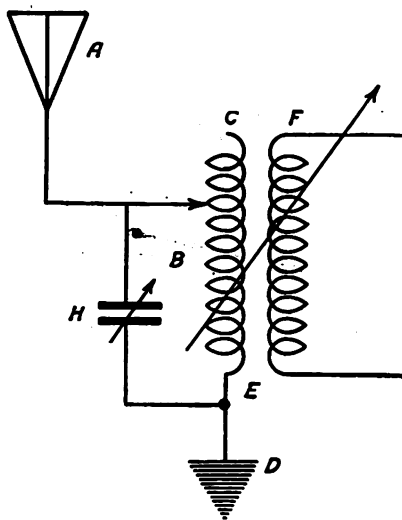
What are the use of tertiary windings?

Tertiary windings are supplied for lighting the filaments, thereby eliminating batteries.

* * *

What is the symbol of a vario-coupler, or loose coupler, and how does it look in a circuit or diagram?

The symbol of a vario-coupler, or loose coupler, is the sketch shown above. A vario-coupler and a loose coupler have two coils, known as primary and secondary. One coil of the vario-coupler, the secondary, is mounted on a shaft and placed inside



Schematic diagram of vario-coupler, or loose coupler, in a circuit.

of the primary at an inductive relation to the primary. Means are provided so the secondary may be rotated in order to increase or decrease the mutual induction between the two coils. The loose coupler is of the same principle and is made so the secondary may slide in and out of the primary. The letter F in this diagram represents the secondary of the coupler. E indicates the coupling between the two coils. The arrow proves that the coupler is variable. Whenever this symbol is given in a diagram, it means that it represents the primary and secondary of a vario-coupler or loose coupler.

* * *

Can continuous-wave power transformers be used for operation on alternating current and how are they made?

The development of the vacuum tube as an amplifier and rectifier made it possible for anyone having an antennae to transmit signals and the human voice by means of continuous waves of radio frequency. Formerly the old source of energy was a high-voltage direct-current generator, or battery; but by employing rectifying vacuum tubes, chokes, condensers, and a properly designed transformer, it is now possible to use the ordinary lighting-circuit alternating-current supply thus affecting a considerable saving in the cost of high voltage direct-current supply. These transformers are designed to operate on 110 volts AC, 60 cycle-source on the primary, and have two

secondary windings of 550 volts each for the 200-watt size, 325 volts for the 50-watt size, and two tertiary windings of 12 volts each, one for rectifying tube-filament heating, the other for power-tube filament heating.

* * *

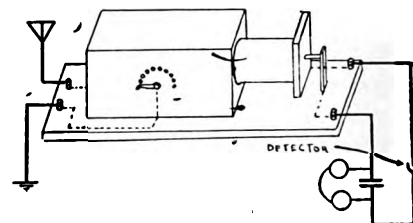
Does the single-slide tuning coil differ in any way from the loose coupler or vario-coupler?

There is a great difference between a single-slide tuning coil and the coupler. This is the difference: With the vario-coupler, or loose coupler, we have a primary and secondary winding whereas, with the single-slide tuning coil we merely have one coil known as the primary. It is called, frequently, a single circuit. With the single-circuit, or single-slide tuning coil, we cannot produce good tuning-qualities, as we have no means for eliminating, or decreasing, the mutual induction. We also have no coupling. With the vario-coupler, or loose coupler, we are able to have the advantage of both controlling mutual induction and eliminating interference. This is accomplished by coupling.

* * *

What side of a loose coupler is the primary wiring? What is the secondary? Can this be identified easily?

The primary winding of a loose coupler comprises the larger coil of the two. The smaller coil which can be pulled out of the larger is the sec-



Schematic diagram of complete crystal set employing a loose coupler.

ondary. A schematic diagram is published herewith of a complete crystal set employing a loose coupler. It will be seen that the larger coil is the primary and the smaller the secondary. This is one method of identifying a loose coupler.

If you did not get a copy of Radio World No. 1, send us \$6.00 and we will send you this paper for one year, and start it with our first issue, which will be mailed you as soon as possible after receipt of order.

Navy Planes Rely Solely on Radiotelegraphy for Communication

By Washington R. Service

THE United States Navy's development of radio apparatus and equipment for use in service aircraft, has been one of the greatest contributions to the progress of radio communication in the air, even advancing the art of flying itself. Both of these facts, experts in radio and aviation believe, are gradually placing the Naval aircraft of this country in the very fore of flight and aerial telegraphy.

Today the Navy's planes rely solely on radiotelegraphy for communicating with other planes, land stations, or ships, the radiotelephone having been practically discarded by Naval pilots, although still used in the Army Air Service. The marine pilots found that telephone sets were impractical. They were too heavy and had inferior ranges, besides being inaccurate and causing much interference. Formerly, they admit, radiophone communication was very convenient for pilots who were not telegraph operators; but, today, as all Naval aviators are code operators, this advantage is lost. The continuous wave-system, known to require skilled operators, was recently requested by the operating units of the Pacific Fleet Air Squadrons to the exclusion of all other methods.

All Naval scouting planes are equipped with radio transmitters capable of sending messages 400 miles, either while in the air or on the sea. While the Navy is not saying much about them, it is known that better and more powerful radio sets are available, held in reserve, while, for economy, the older stock is being used. Spotting planes, however, are equipped with the latest designed continuous wave sets, which have given satisfactory communication when large numbers of planes in the air were transmitting simultaneously.

May Transmit 300 Miles

Recently developed radio apparatus permits a disabled seaplane on the water to transmit up to 300 miles. Compass bearings sent from a distance of 400 miles have been picked up by planes resting on the surface of the sea.

Pioneer experiments in radio for Naval aircraft began as early as 1911. By 1916, the Naval experts succeeded in interesting commercial wireless manufacturers to the extent that four out of seven bidders built sample airplane sets which would transmit about 100 miles while in flight and weighed

less than 100 pounds. The first step in the development of long-distance radio for aircraft resulted in the ordering of seventy-five sets divided among the four pioneer bidders.

This same year saw the successful development of sound-proof head receivers, enabling the pilot to hear code signals despite the roar of the engine, propeller, and wind. Tests were also made with the radio compass mounted in an airplane and a number of aerial radio-compasses were ordered. When more funds for research were made available during the World War, some of the larger naval planes were radio-equipped and, due to improvements made by the Naval experimenters, planes now communicate with ships 400 miles distant and with other planes up to 150 miles away.

The Navy's Radio Laboratory

Most of the radio development work in the Navy has been done in a small but highly efficient radio laboratory at the Anacostia Naval Air Station, near Washington and close to NOF. There, advanced designs for transmitters and receivers are available when new apparatus is required for service uses. Among the problems now receiving attention is the design and test of radio-

compass equipment for aircraft, capable of receiving bearings up to 1,000 miles. A special low-lying antenna for the big airship field at Lakehurst was recently designed and is now being installed at the future home of the big ZR ships. Some of the work under way is confidential and is reserved for military use only.

Almost all the development work is also of benefit to commercial builders and operators of aircraft. The kite antenna and radio equipment for seaplanes forced down, for example, has great commercial life-saving values. The landing field indicator and piloting cable for aircraft is applicable to inter-city air lines and trans-continental air routes. It gives out an audible signal making it possible for the pilot to keep on a route in darkness or fog, and will have practical application as soon as long-distance aerial routes are established. A short while ago, the aircraft teletype was successfully demonstrated between a seaplane and the Anacostia Laboratory. This scheme has been offered to the world for commercial application.

Such are a few of the radio developments, which, it is believed, are establishing the Naval aircraft of the United States as the best in the world.

Receiving Set for Electric-Light Indoor Aerial

By John Kent

IF you intend to utilize the electric-light power-lines in your home as an aerial—particularly if an outdoor aerial is out of the question—it should not be overlooked that conditions governing the use of a special plug in the socket, for this purpose, are so varied that a description of a receiving set should be of interest.

It is essential that such plugs should be the output of reputable concerns. Care should be taken that the condensers in the plugs will withstand any voltages that might exist on the line. See that its dielectric is not made of paper.

There are some receivers that will not even operate on an outdoor antenna, and no results may be expected by using such a set on electric-light lines. Tuning is much more critical with such a system and, therefore, must be made

more carefully than if an outdoor aerial is used. If one has a little patience, however, its use will bring success in the face of apparent failure.

Sometimes there are local conditions which make it impossible to obtain results with the plugs just as they may make reception with aerials extremely difficult. Such conditions will be found when operating in buildings which are heavily shielded or in places that are close to power plants and electric lines carrying heavy loads of current. Another important factor is the distance of the user from the transformer in a system using alternating current.

It is stated that the Board of Fire Underwriters is now making rules governing electric-light plugs. When effective, these rules will be a safeguard for the purchase of such plugs.

Complete Method for Building an Electron-Tube Detector Unit

By the Experts of the United States Bureau of Standards

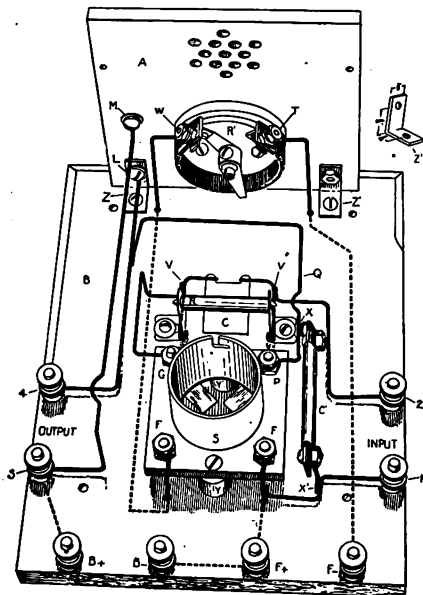


Figure 1—Schematic design showing baseboard upright panel, socket, and other accessories fully described in this article.

THE electron tube-detector unit described in this article may be substituted for the crystal detector, that is its function is the same as the crystal detector, which is to make the signals from the radio transmitting-station audible in the telephone receivers when the radio receiving-set is tuned to the proper wave-frequency (wave length). The use of an electron tube-detector will increase the receiving radius of the receiving set so that it will be possible to hear high-power transmitting stations at a distance of about seventy-five miles, provided the transmitting station uses wave frequencies between 500 and 1,500 kilocycles per second (wave lengths between 600 and 200 meters). Under good atmospheric conditions, signals from greater distances may be heard, especially at night.

This electron-tube detector unit is one step forward in the understanding of more sensitive and complex apparatus. The simple electron-tube detector circuit will not make "continuous-wave" signals audible.

The cost of an electron-tube detector unit, complete with the necessary batteries will be between \$23 and \$37. Additional electron-tube amplifiers will greatly increase the sensitivity, hence the receiving radius of the receiving set will not require additional storage batteries. This will make the added cost of the amplifiers small.

The complete radio-receiving equipment may be divided as follows:

Antenna, Lightning Switch, Ground Connections, and Telephone Receivers.

The Tuning Device. This may be the tuning coil described in Bureau of Standards Circular No. 120 or it may be the two-circuit coupler and variable air condenser described in Bureau of Standards Circular No. 121. While the two-circuit tuner will be somewhat more selective than the single-circuit tuner, as stated in Circular No. 121, its use is not absolutely essential. The two-circuit tuner is also more difficult to operate than the single-circuit tuner.

Electron Tube Detector Unit. (Figures 1, 2, and 7). The electron tube detector unit is composed of a baseboard B and an upright panel A. On the baseboard B is mounted an electron tube E (shown only in Fig. 7), an electron tube socket 6, a resistor (grid leak) B, a grid condenser C, a by-pass condenser C', and eight binding posts. On the upright panel A is mounted a filament rheostat R', (the adjusting knob J is shown in Figure 7), and two telephone receiver binding posts L and M. The parts S, R, C and C' are also shown in Figure 3. This Circular tells how the various parts are assembled on the baseboard and the panel. No description is given of how the parts E, S and R' are made because these are all commercial articles. It is, of course, possible for one to make parts such as the electron tube socket S and the filament rheostat R'.

Accessories. Under this heading may be listed a six-volt battery, used for lighting the filament, often called the A battery, having an ampere-hour capacity of about 60, a 22½ to 45-volt dry battery (B battery), binding posts, stiff copper wire, wood boards for the baseboard and upright panel, and two brass angle-braces for supporting the panel. The A and B batteries are shown in Figure 7. The A battery will usually be placed on the floor beneath the table upon which the other parts of the equipment are mounted. Its comparative size is much reduced in the drawing. An insulating material panel may be substituted for the wood if desired. The electron tube detector may also be entirely enclosed in a wood cabinet with a hinged cover, if desired.

Baseboard. (B Figures 1 and 3). The base B is any kind of dry wood about 6¼ inches by 8¾ inches by ¾ inch thick. Eight holes are drilled through the base in which the binding posts are fastened. Spacing of

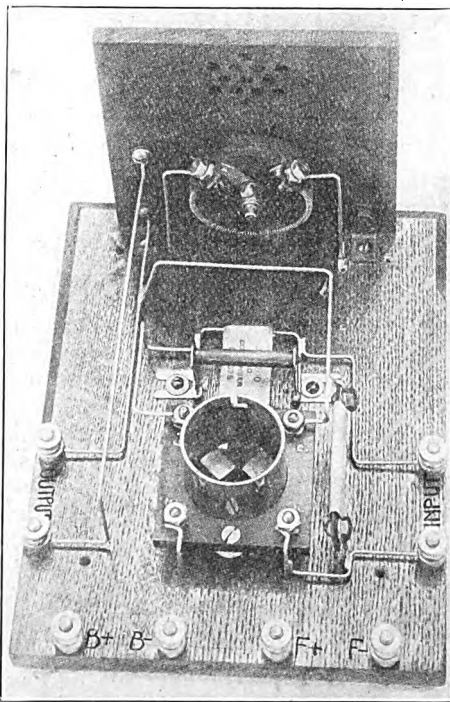


Figure 2—Baseboard, upright panel, socket and other connections when completed, as shown by a photograph.

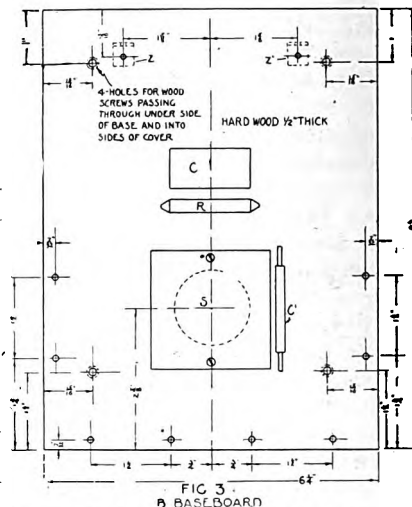


Figure 3—Showing correct borings for holes.

these holes is shown in Figure 3. By the addition of two more binding posts properly connected, this detector may be used in a "regenerative" circuit when the binding posts are externally connected to a "tickler" coil coupled to the tuner. These binding posts are added to the detector baseboard B in line with the "input" binding posts Nos. 1 and 2 (see Figure 1). They are 7/32 of an inch from the edge of the baseboard, and the four binding posts are arranged in such a manner that they are equally spaced, 1½ inches between centers. Referring to Figure 1, the wire which leads from the terminal P of the electron-tube socket is cut at some convenient place Q and the two ends thus formed connected to the extra binding posts. The method followed in making these connections does, of course, correspond with the style of wiring used in the complete electron tube detector unit. The connection X, from one terminal of the condenser C', is also removed and a longer wire connected from this terminal to the other side of the point Q where the wire was cut. The base is arranged so that the three remaining sides and a hinged cover may be added without changing the relative positions of the binding posts. Under each of the four corners of the base B, rubber or wood feet (risers) are fastened in order that the binding post heads and wiring will be protected on the under side of the base.

Upright Panel. (A Figures 1 and 4.) The panel A is any kind of wood about 4½ inches by 5 inches by 3/8 inch thick. In Figure 4 a back view of the panel is shown which brings the two holes for the telephone-receiver binding posts in the lower left-hand corner. If the panel is viewed from the front these two holes will be at the lower right-hand corner. It seems quite desirable that this board present a good appearance, it being the front panel. Four holes are drilled in the panel A, one for the bolt which fastens the panel to the base (see L, Figure 1), two for the telephone receiver binding posts L and M (Figures 1 and 7) and one for the shaft of the filament rheostat R' (see Figure 1). The exact location of the hole for the rheostat shaft is determined from the rheostat itself. It is drilled so that the rheostat will

(Continued from preceding page)
occupy as low a position as possible, allowing room enough to do the necessary wiring.

Electron Tube. (E Figure 7.) The electron detector tube is a commercially available type.

Electron Tube Socket. (S Figures 1, 2, and 7.) The electron-tube socket is of commercial design. No suggestions are offered as to the particular kind of socket to use. There are many types available and the majority of them will be found satisfactory for this purpose.

Grid Leak and Grid Condenser. (R and C Figures 1, 2, and 7.) The grid leak and grid condenser may be purchased together

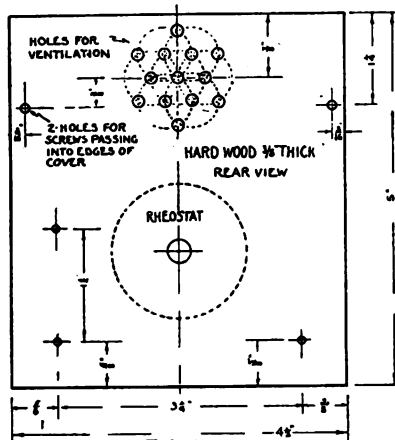


FIG. 4
UPRIGHT PANEL

- 2 BOARDS FOR SIDES $7\frac{1}{4} \times 5\frac{1}{2}$
- 1 BOARD FOR BACK $5 \times 3\frac{3}{4} \times \frac{1}{2}$
- 1 BOARD FOR TOP $7\frac{1}{4} \times 5\frac{1}{2} \times \frac{1}{2}$
- 2 HINGES BUTT $\frac{1}{4}$

Figure 4—Schematic design of the upright panel.

or separately, or they may be constructed. If one expects to use a detector type of electron tube (sometimes called "soft" or "gas" tube), it is recommended that these two parts be purchased with the tube, care being taken to select the proper values of resistance and capacity for the grid leak and the grid condenser, as specified by the manufacturer of the tube purchased. The resistance of the grid leak will usually be between 1 and 5 megohms (1,000,000 and 5,000,000 ohms) and the capacity of the grid condenser will be about .0003 of a microfarad (30 micromicrofarads). If an amplifier type of electron tube (sometimes called a "hard" tube) is used, the resistance of the grid leak may generally be anywhere within the resistance limits specified above and the same size of grid condenser used as

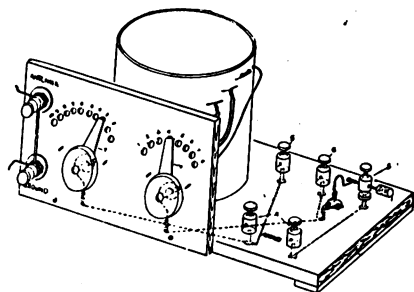


Figure 5—Schematic diagram showing the tuner and panel with knobs, switches, and connections with aerial and ground.

mentioned above. Experimental grid leaks may be made for such electron tube detectors. This is only suggested for its educational feature. If the two-stage audio-frequency amplifier is used also, it will be quite difficult to make a grid leak that will work satisfactorily. Such an experimental grid leak may be made from a piece of fiber

about $\frac{3}{8}$ inch wide, $1\frac{1}{2}$ inches long and from $\frac{1}{32}$ to $\frac{1}{4}$ inch thick. Two $\frac{1}{8}$ -inch holes are drilled along the center line of the piece, about 1 inch apart. A line is drawn between the two holes, using India or drawing ink. Contact with the ink line may be made by the use of two brass (6-32 or 8-32) machine screws about $\frac{1}{2}$ inch long and each equipped with one nut and two washers. The machine screws are put through the holes in the ends of the fiber strip with one washer on each side of the fiber strip. A small piece of tin-foil may be rolled up and wound around each machine screw between the fiber and the washer so that the tin-foil pad will make contact with the ink line. When the nuts are tightened down, the tin-foil pads will flatten out and form a contact between the brass washers and the ends of the ink line. Since the ink line makes a partial electrical conductor of high resistance, the thickness and width of the ink line will determine the resistance of the grid leak to a great extent. The value of resistance may be decreased by inking the line over several times, until the electron tube detector works best.

By-Pass Condenser. (C' Figures 1, 2, and 7.) This is any small-sized fixed condenser having a capacity of from .0003 to .0015 of a microfarad (300 to 1,500 micromicrofarads), which may be purchased or made. This condenser is not absolutely necessary, its use is advisable.

Binding Posts. (Figures 1 and 2.) The binding posts used on the base may be 6-32 or 8-32 brass machine screws each equipped with two nuts and two washers, if regular binding posts are not available. The telephone receiver binding posts, L and M (Figures 1 and 7), should be of the set-screw type to admit the tips of the telephone receiver cords.

Filament Rheostat. (R' Figure 1.) As has been previously stated, the filament rheostat may be constructed but no details are furnished. If the rheostat is purchased, it is desirable to select one designed for panel mounting as well as one having a neat appearing knob and pointer. The rheostat should have a resistance of about seven ohms and a current-carrying capacity of about $1\frac{1}{2}$ amperes.

Accessories. The accessory batteries are commercial articles. The purchaser of a storage battery for lighting the filaments should get full instructions from the dealer for testing and recharging the battery. The dry battery ("B" battery) usually used for the plate circuit cannot be recharged. The normal life of a battery of reliable manufacture is about six months. Storage batteries for use as "B" batteries are available. Their first cost is greater than that of dry batteries, but they may be recharged.

Wood Finish. It is essential in electron-tube sets that the wood be protected from moisture. While the wood base and panel may be treated with paraffin, it was found more satisfactory to first dry the wood and then stain and varnish it, using a good varnish, preferably insulating varnish. Shellac is not recommended. It is rather difficult to give definite suggestions concerning drying and staining of wood. Wood may be put in a warm oven for an hour or so to insure more or less complete drying. A lamp-black or carbon pigment stain is not used ordinarily on such radio parts and it would be well to avoid the use of such. The stain and varnish are thoroughly dried before the apparatus is mounted on the wood baseboard and panel.

Baseboard. (B Figures 1 and 7.) The eight brass machine-screws or binding posts are put in the holes already drilled in the baseboard. If machine screws were to be used the heads would be put on the under side of the baseboard with a brass washer between the head and the baseboard. A brass washer and two nuts are then fastened to

each screw, on the upper side of the baseboard, with the washer next to the baseboard. The tube socket S, the grid condenser C, the grid leak R and the by-pass condenser C' are next screwed to the baseboard. (Certain types of condensers will be held in position by the wiring only.) The exact location of these parts cannot be stated because the several types of parts commercially available will vary somewhat in dimensions. One can get a very good idea of the relative positions of the several parts from Figures 1, 2, and 7. The tube socket S is mounted so that the two terminals marked G and P (Figure 1), are nearest the upright panel. Blocks Y and Y' are put

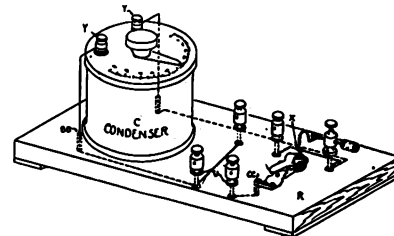


Figure 6—Schematic diagram of condenser mounted on panel with connections and necessary binding-posts.

under the socket S so that the four terminals of the socket do not touch the wood baseboard.

This is done by cutting off two round wood blocks just long enough to raise the socket terminals clear of the base, and mounting them so that the screws which hold the socket to the baseboard will pass through holes in the centers of the blocks. After the socket S, grid condenser C, grid leak R, and by-pass condenser C' are mounted the parts are wired up. No. 14 bare tinned copper wire is used in wiring. This makes the connections stiff and self-supporting. This wire is ordinarily furnished in rolls. The wire should be straightened before it is used. It can be straightened by clamping or otherwise fastening one end solidly and pulling on the other end just hard enough to stretch the wire slightly. It is also a good plan in wiring such sets to have all wires run as directly as possible, neatly, and all bends made at right angles. When a wire is attached to a binding post, a loop or eye is formed on the end of the wire and the wire at the eye flattened with a hammer. This gives more contact surface. Special lugs may also be soldered to the ends of the wire before the connection is made.

A small hole is drilled through the baseboard just back of each of the tube socket terminals marked F. (See Figure 1.) A short piece of wire is fastened to the right-hand socket terminal marked F and is then led through the small hole in the baseboard to the under side of the baseboard. The same wire is led to the binding post F+ and fastened between the machine screw head and washer underneath the baseboard. The same wire is further led to the binding post marked B and fastened between the machine screw head and washer underneath the baseboard. All wires which are run on the under-side of the baseboard are shown by dotted lines. A short piece of wire is soldered to the wire leading from the right-hand socket terminal marked F, just above the baseboard and led to the "input" binding post No. 1, and fastened between the washer and the first nut. This wire is shown as a solid line which means it is on the upper side of the baseboard. The wires do not touch the wood boards except at the terminals and where the wires pass through holes in the baseboard. The wires may be raised more or less to accomplish this. The two terminals of the grid condenser C are connected to the two terminals of the grid

(Continued on following page)

(Continued from preceding page)

leak R as shown in Figure 1. A wire is soldered at V and led to the input binding post No. 2.

This wire is kept quite close to the baseboard. Another wire is soldered at V' and led to the tube socket terminal marked G. The remainder of the wiring is left until the upright panel is assembled and fastened to the baseboard.

Upright Panel. (A Figures 1, 2, and 7.) The filament rheostat R' is mounted on the

hand hole in the baseboard at the rear of the electron tube socket S and connected to the left-hand binding post marked F. This completes the assembling and wiring of the electron tube detector unit.

Connections. It has already been stated that better results are obtained if the two-circuit tuner is used with the electron-tube detector. However, the single-circuit tuner may be used or the electron-tube detector may be connected to any tuner not already supplied with an electron tube detector.

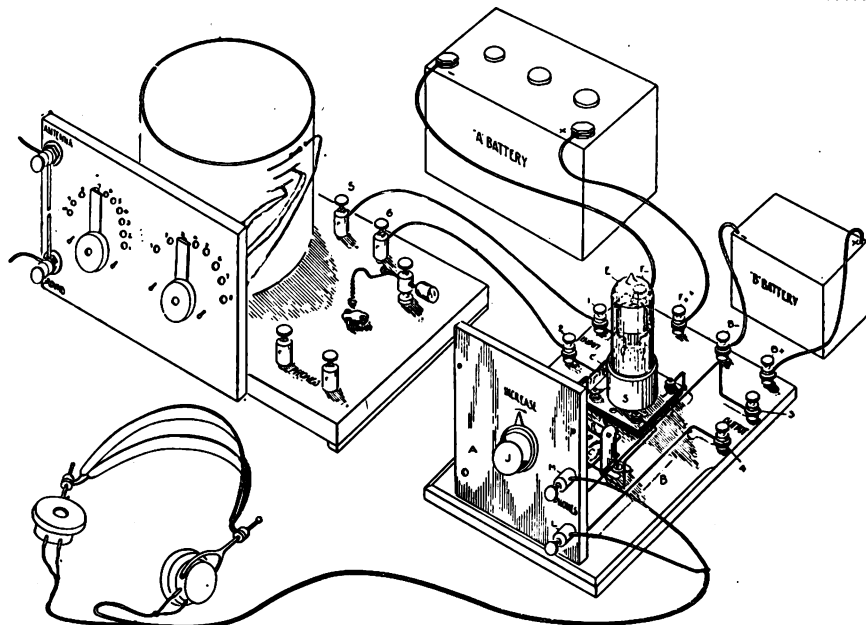


Figure 7—Schematic diagram showing the complete set with tuner, vacuum-tube unit, and storage batteries. One the right-hand side is shown a crystal detector which may be used in case the tube is omitted from the circuit. In this case, the telephones must be changed over to the tuner connections marked "Phones."

upright panel A so that the two terminals will be in a convenient position for wiring. Two binding posts of set-screw type, L and M, (Figures 1 and 7), are inserted in their proper holes, and the upright panel mounted in position by bolting it to the two brass angle pieces (Z and Z') shown in Figures 1, 2 and 3. One of the telephone-receiver binding posts L serves as a bolt. Two small holes are drilled through the baseboard near the two terminals of the filament rheostat R'. A wire is run from the "output" binding post marked 4 (Figure 1) along the upper side of the baseboard to the back of the telephone receiver binding post marked L. A wire is fastened to the tube socket binding post marked P and from thence led to the back of the telephone receiver binding post marked L, or else soldered to a convenient place on the wire leading from binding post L. These wires are shown in Figure 1. A wire is run from the binding post marked 3 to the back of the telephone-receiver binding post marked M and also a wire from B+ to binding post No. 3 underneath the baseboard. One of the terminals of the by-pass condenser C' is connected at the point X and the other terminal of the condenser is connected at this point X'. The method of making these connections depends to some extent on the particular type of fixed condenser which is used. If the condenser be provided with flexible leads one of them is soldered at the point X and the other is likewise connected at the point X'. If the condenser is provided with lugs, connections are made by bending the wires into the proper shape and soldering thereto. A wire is run from the filament rheostat binding post marked T through the hole in the baseboard and thence along the underside of the baseboard to the binding post marked F-. This wire is shown in Figure 1 by a dotted line. Likewise a wire is run from the rheostat binding post W underneath the baseboard and up through the left-

If the single-circuit tuner is used with this electron tube detector the several parts are arranged somewhat as shown in Figure 7. Two more binding posts are added in the back right-hand corner and wired as shown in Figure 5. The greater portion of the wiring is beneath the baseboard. The wires shown as ---- are those already described. The wires shown as are the new wires added. Such wiring will not disturb the set for use as a crystal detector receiving set. The second unit to the right is the electron tube detector described in this circular. Accessory parts such as telephone receivers, B battery and A storage battery are also shown in Figure 7. As previously mentioned, the A battery is shown here reduced in size, and it is usually placed under the table upon which the rest of the apparatus is mounted.

If the two-circuit tuner is used with this electron tube detector the arrangement of the parts is similar to that shown in Figure 7, except that the two units consisting of the coupler, and the variable condenser with crystal detector, replace the single-circuit receiving set shown at the left. Two more binding posts are added at the rear edge of the baseboard supporting the variable condenser and crystal detector (see Figure 6). The dotted lines clearly indicate the new wiring connections as described for the single-circuit receiving set.

The antenna and ground wires are connected as shown in Figure 7. Binding post No. 5 (Figure 7), is connected to binding post No. 1 and binding post No. 6 is connected to binding post No. 2. The telephone receivers are connected to the binding posts L and M as shown in Figure 7. The red (positive, +) wire of the B battery is attached to the electron-tube detector binding post marked B+ and the black (negative, -) wire to the binding post marked B-. An insulated flexible copper wire is run from the red (positive, +) terminal of

the 6-volt A storage battery to binding post marked F+ (Figure 7) and a similar wire from the black (negative, -) terminal of the A battery to the binding post, F-.

Operation. The filament rheostat knob J (Figure 7), is turned to the extreme left and the electron tube E inserted in the electron tube socket S. The filament rheostat knob is then turned to the right until the electron tube filament becomes lighted, the brilliancy depending upon the type of electron tube used. When one of the telephone receiver terminals is removed from its binding post and again touched to the post, a sharp "click" in the telephone receivers will be an approximate indication that the circuit is in working condition. If the test buzzer is available, it may be attached to the tuner binding post marked "ground" and then the rheostat adjusted until the sound in the telephone receivers is the loudest. The reader should bear in mind that the electron tube detector unit is merely substituted for the crystal detector. When signals from a desired transmitting station are heard as loud as possible by tuning, the intensity may sometimes be improved by adjusting the knob on the filament rheostat so as to increase or decrease the filament current (current from A battery). The knob is kept in the position of minimum filament current without reducing the strength of the incoming signals.

If a detector type of electron tube be used, the voltage of the B battery is changed until the greatest signal intensity is obtained. This necessitates a tapped B battery.

The operator must not expect too much of the apparatus at the first trial, and even assuming that he has had experience with crystal detectors, some difficulty may be experienced in getting the electron tube to operate.

It has been stated above that certain connections were soldered. In fact, one could well advise that all connections about a radio circuit be soldered, but soldered correctly. There are some general hints that may be given, but judgment is essential.

(1) The soldering copper must be clean and the tip well coated with solder. If the tip of the soldering copper is not bright, it should be filed clean. It is then heated, care being taken that the tip is not directly in the flame. After the copper is hot—not red hot—it is dipped in the soldering flux or paste and the copper tip coated with solder.

(2) The wires are cleaned where the soldering is to be done, using fine sandpaper, then a small amount of soldering flux or paste is applied at the joint, and the wires to be soldered are tinned or coated with solder before the wires are joined. After the wires are tinned they are soldered together, using just enough solder to make the joint solid. The joint should not be jarred while the solder is still soft; to do so weakens the joint and gives the solder a dull appearance. A good soldered joint will be smooth and bright.

The following list includes the cost of parts of the electron tube detector unit and the A and B batteries:

Electron Tube Detector Unit

Electron tube	\$5.00 to \$6.50
Electron tube socket .....	.75 to 2.00
Filament rheostat	1.00 to 2.50
Grid leak and grid condenser ..	.50 to 1.50
By-pass condenser about ....	.35
Ten (10) feet No. 14 bare tinned copper wire about...	.10
Miscellaneous binding posts and screws, about .....	.75

Batteries

A storage battery, 6-volt, 60 ampere-hour capacity	\$15.00 to \$20.00
B battery, 22½ to 45 volts ..	1.00 to 3.00

Total\$23.25 to \$36.70

Radiograms

Latest Important News of Radio Garnered from the World Over, and Reduced to Short Wave-Lengths for the Busy Reader.

THE strongest evidence of the growth of radio communication is contained in an announcement by Edward J. Nally, president of the Radio Corporation of America, that an agreement has been signed by his company and the Postal Telegraph-Cable Company whereby every postal office in the United States becomes an agency for acceptance of radiograms for transmission across the Atlantic and for the delivery of radiograms received from abroad. The Radio Corporation's stations transmit and receive messages directly to and from England, France, Norway and Germany, and through connecting stations abroad, to and from all countries in Europe, Asia and Africa. The company now maintains the only direct line of radio communication with Germany and Scandinavia and additional direct service is planned for the near future with Belgium, Holland, Italy, Poland and Sweden. Prior to the new arrangement, practically all of the radiograms transmitted to trans-Atlantic countries originated in New York and in Washington. The contract just signed gives to inland communities equal facilities with the Atlantic seaboard.

Radio concerts for airship passengers have now become an assured fact, as proved by the trip of a commercial passenger airplane from Geneva to Paris. The experiment, which had been tried on the Paris-London route with only passable results, was, on this trip, wholly successful and satisfactory.

The steamer "Pan-America" is equipped with the latest type of arc transmitter, having a range up to 5,000 miles, and, in addition, a one-kilowatt Navy standard spark-transmitter with a transmitting range up to 1,500 miles. This is the steamer that carried Secretary of State Hughes to the Brazilian Exposition. The chief wireless operator, L. K. Meriweather, and his assistants have the distinction of being the first in the history of radio to hear messages through the most powerful receiving apparatus ever installed on a merchant vessel.

To show the world-wide interest in the anti-prohibition poll now being conducted by "The Literary Digest," it may be mentioned that the "Wireless Press News," printed on a steamer en route between America and Japan, contained a radio dispatch, bulletined over an area of forty-six million square miles of Pacific Ocean, which carried returns then available.

Because certain Canadian amateurs have call letters similar to those of amateurs in this country, the Canadian department of the naval service has under consideration a plan to change call letters in the Dominion. Canadian amateurs have calls consisting of a number followed by two or three letters like amateur stations here. The Canadian stations with calls beginning with Nos. 1, 2 and 3 are in the southeastern part of that country somewhat near to the United States stations having calls beginning with the same numerals. Therefore it is possible for a Canadian station having a call, say 1AB, to work with a United States station having the same call.

The first organization for the blind to make systematic use of radio was the New York Guild for the Jewish Blind, which secured a modest crystal-set and a single-tube set, and conducted code classes for blind boys, who learned to copy commercial messages, including the various wireless press services.

Baseball fans who are also radio fans will be able to follow the World Series at home this year. WGY, the radio broadcasting station of the General Electric Company, will give a play-by-play report of the World Series. Direct wires from the ball park will carry every play practically the second it happens and these will be relayed by wireless the instant received.

The Canadian public is looking to radio for much of its entertainment. This is proved by the fact that several theatres in Toronto and throughout the province of Ontario have installed radio-receiving sets in their buildings for the purpose of giving radio concerts each evening. They have secured the services of a number of artists who will perform in the Marconi Company's large new broadcasting station on the roof of the Canada Central Building.

Swedish electrical dealers have been trying to obtain modification of the regulation which forbids the use of radio apparatus by amateurs, but so far without results. Should its use by individuals be permitted there would be a good market for

wireless goods in Sweden, owing to their interest in all things electrical, and the short distances between cities in Sweden and cities in neighboring countries.

The radio set at Clifden has been saved. A patrol of four National Army men proceeding toward Ballinaboy Bridge, near Clifden Wireless Station, County Galway, was ambushed by forty irregulars, whose intention it apparently was to cut off the Marconi station garrison from its base. The patrol, however, took cover and held its position until reinforcements arrived, when the irregulars were put to flight.

Two new stations have been opened by the United States Signal Corps. One is located at Fort Totten, New York, and the other at Fort Benning, Georgia. This brings the total number of Signal Corps Stations to 53. Another station is planned for Fort Sill, Oklahoma. When completed it will bring the eighth area into the Army radio net. The Signal Corps will then cover the entire country with its radio service.

Italy is demanding more radio apparatus. There is a growing interest on the part of the Italians for American production of radio apparatus. Inquiries are being received both for transmitting apparatus to be used in broadcasting and for the radio telephone receiving sets. If American manufacturers interested in the possibilities of the Italian market for their product will send catalogues and other descriptive literature to the office of the American Commercial Attache, care of the American Embassy, Rome, such material will be made available to all persons inquiring.

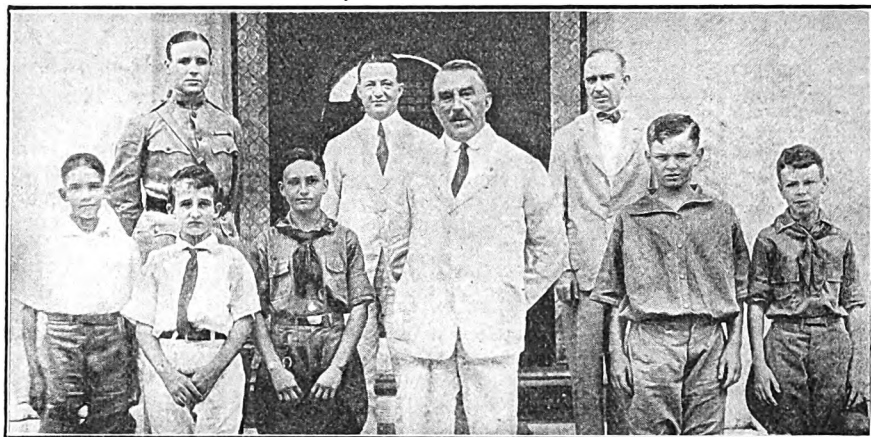
Japanese capitalists, headed by Baron Shibusawa, have asked permission to establish a radio station in Japan so communication may be held with America and Europe. The new station will cost about \$97,000,000. The present system of radio communication between Japan and the United States is carried on schedules arranged between the Japanese Department of Communications and the Radio Corporation of America. The international service is generally commended, as previously all radio stations were under strict military rulings.

The Tight-Wave Walker



Cartoon by O. Messmer, in "The Globe"

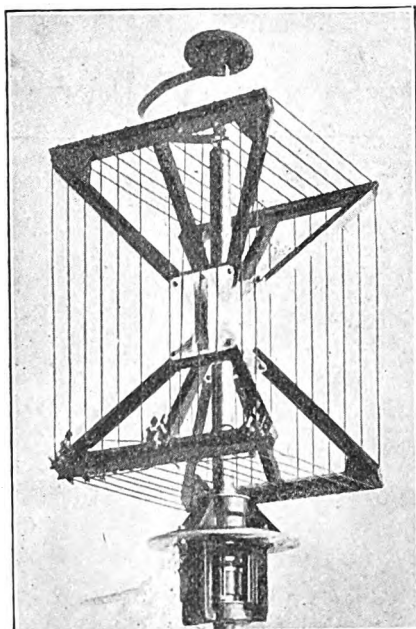
Leonard Wood and His Philippine Island Radio Fans



(C. Kadel & Herbert News Service)

Major-General Leonard Wood, Governor-General of the Philippine Islands, recently greeted the pioneer boys' radio class at the Governor's office at the Malacang Palace, P. I. These are the first boys in the Philippines to make and operate their own radio sets. General Wood is an enthusiastic sponsor of radio and is encouraging radio amateurs who reside on Uncle Sam's protectorate in the Orient. The boys in the photograph above all made successful radio tests, and General Wood was so pleased with what he heard of their work that he requested the young radioists to call at his offices with their sets. The young men proved that they understand radiocraft as well as their brothers at home.

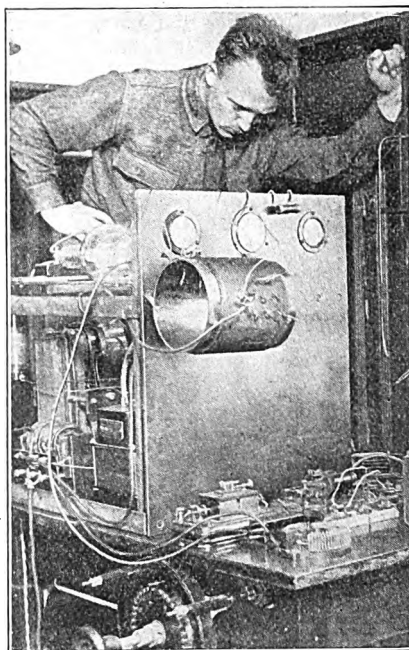
This Is the Aerial Used by U. S. Navy



(C. Kadel & Herbert News Service.)

Loop aerials are being brought into such general use, to-day, by advanced amateurs that Radio World feels justified in printing a photograph of the loop used by the compass stations of the United States Navy. It is somewhat different to other loops and gives excellent results from 600 to 1,000 meters. At some stations, operators could get as low as 300 meters. These loop aerials are the actual instruments that guide the ocean liners to port in bad weather. During the World War they were used exclusively by the United States.

This Is a Short-Wave C-W Transmitter



(C. Underwood & Underwood)

The above photograph is that of a short-wave C-W transmitter, in the station at WVP, Fort Wood, Bedloe's Island, New York. This set was installed by the radiomen of the station so that amateur work may be advanced. Fort Wood is one of the stations ordered by the government to carry on radio instruction and operation in connection with the Amateur Radio Reserve. The transmitter shown has for its power the vacuum tube, an important element for the transmission of continuous waves and radiotelephony. The inductance coil, in front of the panel, is one of the instruments used to regulate the various wave-lengths. The instrument on the table at the right is a wave meter. With the aid of this wave meter, any wave-length desired may be calculated and marked. A wave meter is a handy instrument in a radio station, but due to its high cost, it is seldom used. The meters on top of the panel indicate what the tubes are really doing—if they are operating and forwarding the proper currents. An operator is informed by these meters if power is being transmitted to the breeze, without taking dangerous chances with other older methods that the operator knew, from practical experience, to be hazardous.

Why Resonance Is Essential in Tuning

HIGH-FREQUENCY currents are seriously affected by resistance, more so than low-frequency alternating currents such as are used in house-lighting systems. If an inductance is placed in the circuit by itself, the opposition of the coil to the radio-frequency currents is so great that the current flow through the receivers and detector would be too small for detection. This objection or opposition of the inductance coil is called reactance. Fortunately, the reactance of inductances and condensers are of different kinds. They can be called positive and negative in explanation. It follows that if the inductance applies too great an opposition in the form of reactance, we may add some condenser capacity and gradually overcome it. By increasing the reactance of the condenser, we come to a point where the capacity and inductance are exactly opposite and equal. The high-frequency currents may then flow through the circuit with practically no opposition. When this point is reached, the circuit is in a state known as resonance. In tuning we must have resonance if we wish to hear what is broadcast.

High-Frequency Sets

IN laying out the necessary work and diagrams for radio frequency and the more complicated sets of radio, it is strongly recommended to amateurs that they build an experimental set first rather than attempt to put the apparatus in panel form. An excellent basis for this work would consist of some pine drawing-board and No. 14 bare copper wire. All radio-frequency transformers should be carefully shielded. Too much emphasis cannot be placed on the necessity for making good connections. Use the soldering iron whenever possible. Where flux other than resin is used, all traces should be removed before the circuit is put in use. Bear in mind that the receiving type of tube operates on six volts. In using a six-volt storage battery, especially where several tubes are employed, the voltage drop in the connecting leads may be sufficient to spoil the operation of the tubes. If No. 14 wire is used for the purpose, this source of trouble will be practically eliminated. For shielding the radio-frequency transformers, the best metals are copper or aluminum.

Rules Governing Amateur Radio Operators

THE owner of an amateur radio-transmitting station must obtain a license before he can operate. Provided his station is of sufficient power to cause interference with neighborhood licensed-stations in the receipt of signals from transmitting stations outside his State.

Station licenses are issued only to citizens of the United States, its territories, and dependencies. Transmitting stations must be operated under the supervision of a person holding an operator's license. The owner of a license is held responsible for its activities.

Amateur licenses issued by the United States are granted in three classes. They are special amateur stations known as the Z class, and are permitted to transmit on wave lengths up to about 350 meters. General amateur stations are permitted to transmit on wave lengths up to 200 meters and have an input of 1 kilowatt. Restricted amateur stations are those located within five nautical miles of Naval radio stations. They are not allowed to exceed one-half kilowatt input, but are permitted up to 200 meters. Experimental stations are those of universities and schools, and are known as the Y and X class. They are allowed, usually, the use of longer waves at the discretion of the Department of Commerce.

All stations are required to use the minimum amount of power necessary to carry out communication. Malicious or willful interference on the part of any radio station, or the transmission of false or fraudulent signals, is prohibited. Severe penalties are provided for violation of these governmental provisions.

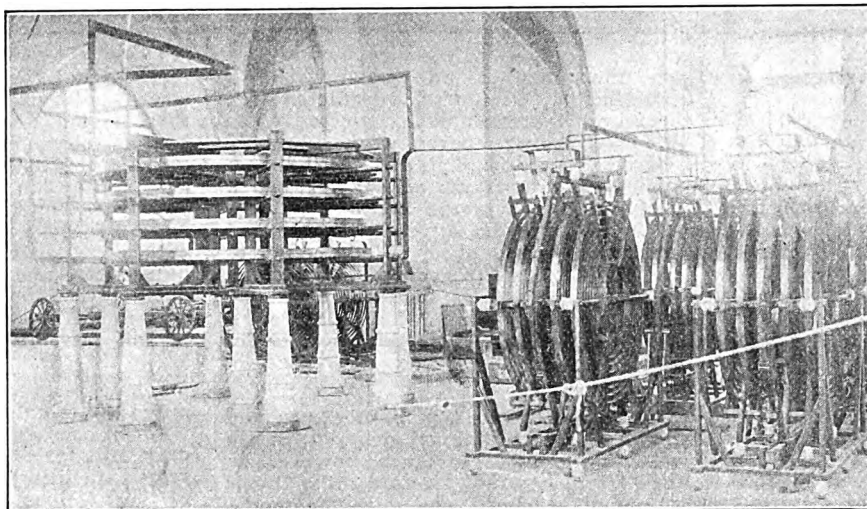
There is no license required whatsoever for the operation of a receiving set, but all amateurs are required by law to maintain secrecy in regard to any messages which may be overhead. There is no fee for either an operator's license or a station license.

Applications for licenses should be addressed to the Radio Inspector of the district in which the applicant, or station, is located.

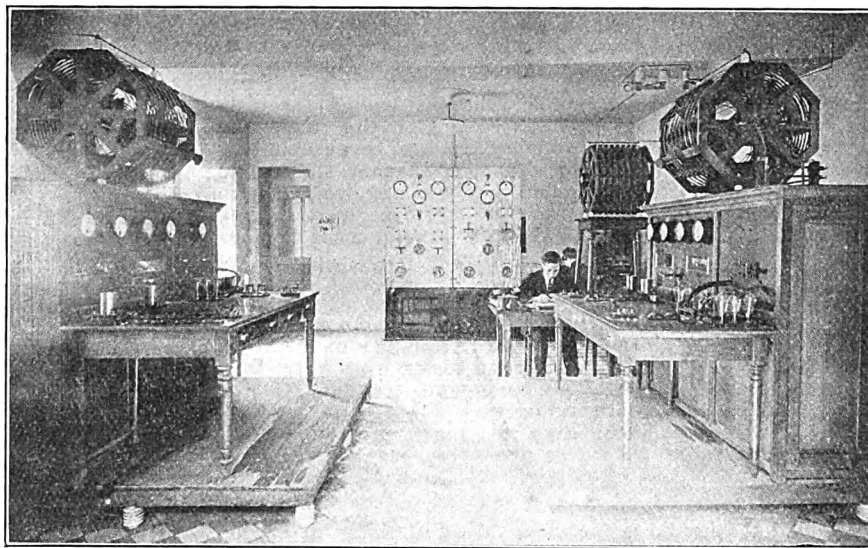
The Hot-Wire Ammeter

A hot-wire ammeter is used to measure the current in the antenna system of a transmitter. The value of the current flowing in this system is usually indicative of the performance of the apparatus. This meter is employed in tuning a transmitter to resonance, so that the maximum value of current may be induced into the antenna circuit.

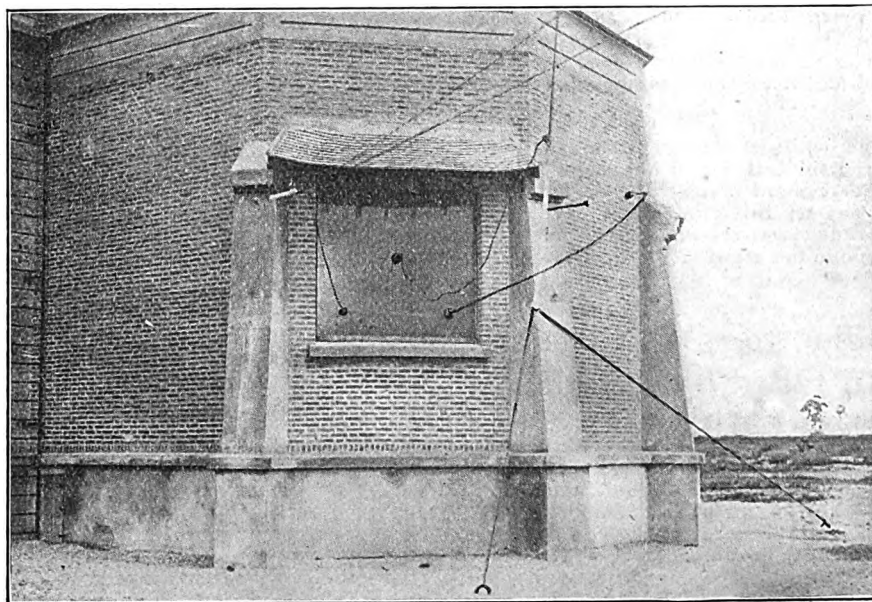
Here France Shoots Her Radios to America



Section of the interior of the great radio station at Sainte Assise, France. To carry on communication with America these large inductance coils are necessary.



The sending apparatus is operated by remote control. The instruments shown make it possible for the operator to have complete control while the set is working.



(3 photos. C. Keystone View Co.)

Lead-in wires from the lofty aerials connect with the apparatus in the building.

Radio and the Woman

By
Crystal D. Tector

I MET, on Broadway, the other day, a woman friend I hadn't seen in a blue moon. Of course, we greeted each other with all the fervor that should be expected when two good friends collide after a long separation. I could only tell her that I am still here in New York, living my same happy, never-idle hours; but she nearly took me off my feet when she informed me that she had been in the South and West for the past five months selling radio apparatus! When I asked her if she had done well, she replied, "Well enough to buy one of the swellest fur coats, for the coming winter, you ever set your eyes on, Crystall! Besides that, I am sending mother to California for the winter—and I have paid off a debt that has been keeping me busy rubbing out wrinkles for the past year—and—"

* * *

Well, she rattled on until I began to wonder if the money she had made wouldn't pay off the national debt. I wasn't so much interested in what she made so much, however, as how she made it. When I told her that I was a radio "bug," her eyes fairly popped out of her head. So we hiked to the nearest tea shop and gassed away; and, finally, I could only invite her up to dinner. Poor Friend Husband! Next morning, as he toddled off to business, he mentioned something about "Never hearing two women talk so in all his life," and he "couldn't get a word in with an axe!"

* * *

But Estelle opened my eyes. She told me that she just had to do something; and while her relations balked furiously when she announced that she was "going on the road," she went just the same. Radio appealed to her because it was new—spick-and-span new—and she realized that she would be entering a field of salesmanship that was not overrun with competitors. She found that several big firms were willing she should represent them; and with a number of smaller products as side lines, she sallied forth.

* * *

Estelle told me that she visited only small town and farming districts. In the towns, she "sold" a number of electrical firms. Among the farmers, she found many who were, first, most anxious to learn all about radio and, secondly, to buy sets as soon as they were sufficiently educated to operate them. She always had, she says, the most interesting audiences, particularly with farmers who were eager for market and weather reports.

* * *

She found that radio is the most talked-of thing in the districts she traversed. "It even supplants prohibition," she quaintly remarked; at which Friend Husband managed to blink his eyes and ask "Izzat so?" She also told me that she received a wire from one of her firms stating that they could not promise to fill orders as fast as she was sending them in. Now, she is trying to arrange with her people to let her go over the same territory to see if all her orders were promptly filled and if all the sets are working satisfactorily.

* * *

And while this may prove costly from the firm's point of view, I think it would be a wise thing to do. No doubt, many of her customers will give her new orders. And as radio is the newest thing on earth, and changing for the better all the time, it would be wise to keep in touch with those who are none too close to the big set centers.

I see that there are radio songs and radio stunts on the stage—and even a show that is called "Radio Girls." Then there is radio cloth, and the permanent radio-wave in one's hair has come to stay. In a candy store, the other day, I was asked if I would like a "radio sundae." Now, it isn't me to pass up anything that relates to my pet hobby, so I promptly tuned in. The concoction was cooling and delicious. The white-garbed youth behind the counter filled a silver dish with every shade of ice cream he had in the place. Over this he poured some marshmallow cream, sprinkled it with grated nuts, stuck a few cherries here and there—and then covered the whole thing with frapped orange juice. I am still smacking my lips!

* * *

I have a letter from a mother in Ohio asking my aid in appealing to the broadcasters to alternate the bedtime stories with an occasional lullaby. This correspondent says that children still love to be sung to sleep—and I believe her. Her set, so she informs me, works so perfectly that a lullaby would be most welcome, and she has three little ones that are tucked away early. Not a bad idea. Some station may take this tip seriously.

* * *

Another correspondent wants to know if I can give her any advice about New York as a safe place for her son who is coming here to engage in the radio business. Her question is a bit out of the ordinary. But all that I can say is that her son will be as safe here as he is at home, if he will take care of himself. New York City was built up by boys who migrated from the country. But they were boys who knew how to master opportunities. It is all up to the boy.

* * *

And—I have received a letter from a man! He resides in Sandusky, Ohio, and has a peculiar grievance—one of those complexities that only a woman can grapple with. At least, so he thinks. My Sandusky friend tells me that he is a "night owl"—one of those radio birds that sit up all night listening for distant signals. Well, the other night,—and this is his story,—he became so interested in trying to pick up the faint call of some distant radioists that he failed to keep an appointment with his sweetheart! Of course, the little lady is deeply peeved and will not speak as they pass by. "What would you do if you were me?" asks my Sandusky hero.

* * *

Well, Sandy, what would I do if I were you? Just go up to her like a man and tell her you're sorry and apologize. Then ask her to come over, some night, with a friend or two and join you in your nightly pastime. Interest her in all the mysteries of radio—let her know the fascination of hearing someone talk to you who is, perhaps, a thousand miles away—let her realize the great fascination of listening for some call and experiencing the thrill only the radioist knows, when it comes in.

* * *

Along toward midnight brew some coffee and bring some nice sandwiches—if you didn't know how to make them you ought to be ashamed of yourself—from your cupboard. Then all sit around the set and sup—and tell them what wonderful nights you have had, what wonderful experiences you have known, what comes to the "night owl" from the far, far distances that comes to no other man on earth.

And I think, Sandy, that before the night is over she will just want to put her arms around your neck and kiss you.

Radio to Be Generally Installed by American Hotels

THAT wireless apparatus in the not distant future will be installed in many hotels and play an important part in the entertainment of the hotel keepers' guests, is the prognostication of the New York State Hotel Association Messenger, says "The Globe," New York. Improvements in radio communication are coming so fast and exciting such widespread

interest that its possibilities as an accessory to the hotel interests may be said to be almost without limit.

It was pointed out that numerous hotels throughout the United States have already instituted radio service for their patrons and others are preparing to do so. A recent striking indication of the drift is seen in the statement that a New York company manufacturing radio apparatus announces that it has contracts for 25,000 receiving sets which operate only on deposit of a quarter—the orders coming chiefly from hotels and hospitals.

If a guest in a hotel room or a patient in a hospital so equipped desires a little entertainment he has merely to drop in his coin exactly as if the set were a chewing gum or penny arcade machine, and he gets everything that comes over for the next twelve hours—jazz, weather reports, baseball scores, etc.

The cost of installation under this system will be borne equally by the company and the hotel or institution, and the profits or loss will be divided equally between them. The machines are expected to be in operation within a very short time.

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Answers to Readers

I HAVE a set with a French detector-tube which I am using as a detector. What would be the proper plate and filament currents to be used in conjunction with this tube?—Marshall Craig, Rome N. Y.

The French tube is practically the same as the American tube with the exception that the plate is cylindrical, lying in a horizontal position similar to the grid. When using this tube as a detector, the plate voltage should be about 22 volts, but if the tube should happen to be extra soft, the voltage will have to be reduced accordingly. The filament may be supplied by a 6-volt storage battery.

* * *

What would be, approximately, the correct number of turns on the primary of the vario-coupler and the rotor in conjunction with the super-regenerative receiver?—Samuel Levens, San Antonio, Texas.

The primary of the vario-coupler should have, approximately, about 50 turns wound on it, while the rotor should have about twice the amount, or a hundred turns. This is needed for the feed-back of the system.

* * *

I have a honeycomb-coil set, hook-up enclosed, with which I get satisfactory results from WHN, WOR, and WIZ; but I cannot hear WVP. Could I use the same 6-volt battery for all three tubes of a two-stage amplifier? Does the rheostat control the plate voltage?—Sidney H. Bohack, Binghams, N. Y.

For WVP, I would suggest you to use L-300 coils. The 6-volt A battery may be used to light all your filaments. The rheostat does not control the plate voltage, but the plate voltage may be controlled by a potentiometer across the filament, to which one tuner lead is connected; or by tape on B battery.

* * *

My aerial is 95 feet long and 15 feet above the roof. It is near iron posts and a tin roof. Would this affect my distance any? Would you advise me to change the position of my antenna?—Ray Whitman, Cypress Hills, L. I.

I would advise that your aerial be changed from its present position to a position that would leave the aerial so it would be clear of all metallic structures.

* * *

I have a pair of watchcase receivers, single pole, 75 ohms. Can they be rewound so as to give satisfactory results in connection with crystal detector? If this can be accomplished, please inform me what size wire should be used.—Milton C. Prince, Brooklyn, N. Y.

It is inadvisable for you to attempt to consider rewinding these receivers. A receiver of this type would not respond to weak signals. It would not have sufficient resistance. We advise a pair of 2000-ohm receivers which would work far better than the ordinary 75-ohm house telephone-receivers, particularly in your case.

* * *

Does copper wire in a solid form work better than Litzendraht wire?—Michael Maloney, Pittsburgh.

It is a fact that electrical energy travels on the edge of a wire. It is known as skin effect. Therefore, Litzendraht, which contains many strands of wire, would have more surfaces for this electrical energy to travel over than just the one strand of the solid copper wire. Litzendraht wire is expensive. It is used in all high-class receivers where exceptionally good results are expected.

* * *

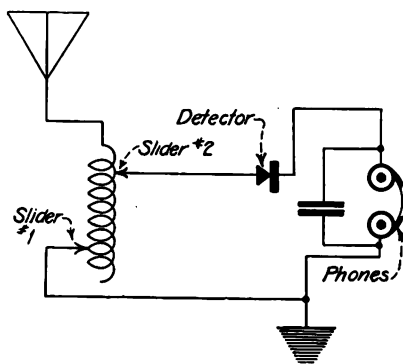
In using the hook-up in RADIO WORLD No.

20, dated August 12, what capacity is the variable condenser, grid condenser and phone condensers? Will this hook-up pick up signals 400 miles from a 500-watt sending station?—M. F. Prine, Hugoton, Ill.

The capacity of the variable condenser is .001 microfarads capacity; grid condenser is .00025 microfarad; phone condenser is simply a fixed by-pass condenser, sometimes called stopping condenser. As this circuit only employs one tube, it is most likely that you will not be able to receive at this distance. We suggest that you add a two-stage amplifier to your set.

* * *

Is it possible for me to secure a diagram showing the hook-up of a two-slide tuning coil with crystal detector and all connections?—William Schaefer, Pawtucket, R. I.



Schematic diagram requested by Mr. William Schaefer, Pawtucket, R. I.

The accompanying diagram shows the complete wiring diagram of a two-slide tuning coil with crystal detector and all connections.

* * *

In the schematic diagram of the complete regenerative set which you published for Mr. Harold Trowbridge, Canastota, N. Y., in RADIO WORLD, No. 21, dated August 19, what are the capacities of C 1, C 2, and the fixed

or by-pass condensers?—Karl Hector, Auburn, Nebraska.

The capacity of the condenser in series with antenna C 1 was of .001 mfd. capacity, while the capacity of C 2 was of .005 mfd. capacity. The phone by-pass of fixed condenser was of .00025 mfd.

* * *

Who is WVP, and what is the wave length he operates on?—John Gleason, Omaha, Nebraska.

WVP is the United States Army reserve broadcasting station located on Bedloe's Island, Fort Wood, New York. It operates on a wave length of 1450 meters.

* * *

Suggest a way of taking taps from the primary of a vario-coupler. Is No. 22 single cotton-covered wire suitable for a vario-coupler?—Ben Schlutz, Pensacola, Fla.

Taps should be taken from each of the first 10 turns and then from each tenth turn. The single taps are brought to a fine switch and the others to a coarse switch. No. 22 single cotton covered wire is suitable.

* * *

In working with a superregenerative set, I am rewinding my vario-coupler which is to be of the 90-degree type. The primary now has 60 turns of No. 22 single cotton-covered wire, and is tapped and each of the first ten turns and then at the 20th, 30th, 40th, 50th, and then the 60th turn. Would you advise me to have a smaller number of turns and a larger wire?—Kenneth Lothringer, Pasadena, California.

The present number of turns you are using on your vario-coupler are sufficient. Don't make any change.

* * *

May I remagnetize my phones if I use them on an alternating current with large electromagnetic?—Joseph Woodson, Topeka, Kansas.

You will ruin your phones if you try to use them with an alternating current. The electromagnet is absolutely useless for this purpose. It is preferable to return your phones to the manufacturer.

* * *

Will placing more than 22 volts on the plate of a UV-200 vacuum tube keep it from working, or does it aid the signal strength?—Paul Wentworth, Kansas City, Mo.

Radiotrons work best with an 18-volt plate; but there are experimenting times when the operator must choose his own plate-voltage.

Marconi Company Wins Radio Rights in Austria

AFTER a hard fight, in which the diplomatic representatives of Great Britain and Germany are said to have played active parts, says "The Times," New York, the Marconi Wireless Telegraph Company of London has defeated the German Telefunken Company and won from the Austrian Government the exclusive right to build radio stations in Austria and to handle all the wireless business between the republic and other countries for the next thirty years, according to reports found in Vienna newspapers. The Main Committee of the Austrian National Assembly, against the votes of the Socialist members, has approved the concession, and it is expected to be ratified by the National Assembly itself when it reassembles after the Summer holidays.

In reporting the conclusion of the negotiations, the Vienna "Arbeiter-Zeitung" sharply attacks the government of Dr. Seipel for giving what may within a few years prove to be an absolute monopoly of Austria's foreign telegraphic traffic to a private company. The Socialist organ also wants to know how a Cabinet containing three Pan-German Ministers could have been induced to turn down a German company in favor of an Entente concern, especially as the Telefunken agents offered to meet every point of the Marconi offer, and it says the public would like to know more about the nature

of the "arguments" brought into play. These questions have also been raised in the Federal Council, so there may be further political battles ahead before the concession becomes effective.

Under the tentative agreement, as summarized in the Austrian press, the Marconi Company is to form an Austrian radio telegraph operating company within six months from the date of the concession. The Marconi Company is to subscribe for more than half of this company's capital stock, the Austrian Government is to take 30 per cent, and a group of Austrian bankers is to participate in the organization. The Board of Directors of the Austrian Marconi Company must be more than 50 per cent. Austrian. The operating personnel must be exclusively Austrian and be selected from among employees of the Austrian State telegraph system. Operations are expected to begin in the Summer of 1923.

In case the net profits of the company exceed 8 per cent., after covering possible deficit in the preceding business year and setting aside the prescribed amount to the reserve fund, the management is to keep half of such excess. When the concession expires, the management has the right to buy the company's equipment within six months at price to be fixed by experts or the Austrian courts.

Radio-Frequency Tuned Amplifier Works Satisfactorily

CONSIDERABLE interest has been aroused throughout the country by the recent development of a radio frequency tuned amplifier. Most efforts along the lines of radio frequency amplification have been confined to the use of the untuned radio frequency transformer, working efficiently over a very narrow band of wave lengths, says "The World," New York. But the unit, being tuned, works efficiently over a band of wave lengths ranging from 200 to almost 600 meters.

This is accomplished by the use of a variable condenser, operating in conjunction with a fixed inductance, both having extremely low resistance, and consequently the interaction between the capacity effect of the condenser and the inductance as well as external body capacity effects are reduced to a minimum, permitting easy tuning, impossible with any other type of variable control of a tuned radio-frequency amplifying unit. When the new unit is used in connection with an audion detector an amplifier tube is placed in the detector unit, with the grid leak and condenser bridged or short-circuited.

The detector tube then is placed in the radio frequency unit, which then contains the radio frequency tuner, detector tube and its control. Engineers have found that this radio-frequency tuned amplifier increases the range and volume of the average detector unit at least ten-times, making it far more efficient, easier to tune and giving to it power to produce satisfactory results in working over a wide band of wave lengths.

One of the features of the new unit is the variable condenser. The most common form of condensers, called interlocking air-plate condensers, depend upon air for the dielectric. Their construction necessitates a comparatively wide gap between the plates, which means low capacity for the given unit of plate area. But the variable condenser under consideration depends upon a thin sheet of mica as insulation between the plates. As there is no friction from the opening and closing of the plates, the mica will last as long as the condenser. Moreover, the mica will stand up under much higher voltage than the average air condenser, without puncturing, breaking down or showering. Therefore, the condenser can be used safely for C. W. work or modulated C. W. work. Any one who has experimented with radio telephone will readily recognize the advantage of this feature.

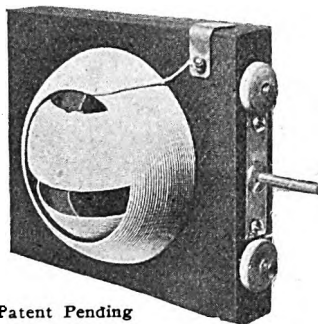
The contacts to the two plates are positive, thus eliminating to a great degree the internal resistance that develops in a short time in the air condenser from corroded spring contacts, etc. Variation is accomplished by the book action of the two plates operated by the cam. This cam is especially designed to as uniform a variation of capacity as possible over the entire range of 180 degree scale. Both plates are almost completely covered with copper, and one copper plate completely covered with a thin sheet of mica. The copper and mica are attached by means of a special grade of cement having high electric properties, to eliminate possibility of leakage.

Hence the calibration curve of the condenser is most satisfactory. Tests in the laboratories of one of the leading universities of the United States have shown the maximum capacity never to be less than .0008 Mf. This frequently runs much better than .001 Mf.

A Radio Necessity!

Latest broadcasting map 15c. That is, a complete broadcasting map appeared in Radio World, No. 8, dated May 20. Mailed on receipt of 15c. Radio World Company, 1493 Broadway, N. Y. C.

RADIOMART VARIOMETERS ARE SELLING FAST!



Patent Pending

The Design Is As Efficient As It Is Exclusive

Such is the VERDICT of all radio men. There is a minimum clearance between stator and rotor; our process makes the coils as strong as metal; with no dielectric losses; nickel plated brass bearings. A three-inch dial will cover the two mounting screws.

RADIOMART variometers are best for 3 circuit and single circuit receivers. Wave length, 150-600 meters. They are the neatest and best shaped variometers made anywhere. Satisfaction guaranteed.

Price, \$5.00 prepaid. Cash or C. O. D.

Our Literature is Free!

More Dealers Wanted!

RADIOMART CO.

1230 American Ave.
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Hard Rubber Composition PANELS

Conform to Navy Specifications

A High Resistance Panel, Guaranteed Not to Warp, and Drilled Cleanly Without a Burr. Highly Polished—Edges Ground to Size.

Standard sizes, 7x18x3/16, 7x18x3/16, 7x24x3/16, 10x12x3/16, and 12x14x3/16, in stock for immediate delivery. Orders for special sizes received in the morning, shipped the afternoon of the same day. Binding posts, dials, and knobs to match. We have a complete line of Coils, Variometers, Variocouplers, Sockets and Rheostats.

Largest Discounts.

Jobbers and Dealers! Write for proposition and Free Sample!

CAREFUL ATTENTION GIVEN TO ALL RADIO ENTHUSIASTS

ALLIED RADIO COMPANY, INC.

Dept. D, 449 SEVENTH AVENUE, NEW YORK CITY, Fitzroy 3731

WANTED—A Reliable New England Representative.

For CORRECT RADIO MAILING LISTS Use THE POCKET LIST

of Radio Manufacturers, Jobbers and Dealers in the United States and Canada. Issued Quarterly—January, April, July and October. October, 1922, issue corrected to September 15th, 1922. Classified under three different headings—Manufacturers, Jobbers and Dealers—and alphabetically arranged by states, cities and towns and names of firms. Containing approximately 15,000 names and addresses.

We have been exceptionally careful to see to it that every Manufacturer, Jobber and Dealer is listed and, under the PROPER CLASSIFICATION. Most mailing list concerns charge more than \$100 for a list of this kind and, as a rule, those supplied are far from being correct. Compare this list with any other, and you will find it to be the very best obtainable anywhere at any price.

October issue ready for distribution September 25th. Price \$5.00 per copy, or \$10.00 per year (four issues, including monthly supplements which keep the list absolutely correct and up to date at all times). October edition limited. Send your order with remittance today.

F. D. PICKENS, 1821 CARRINGTON STREET
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"TUNING IN"

TO THE RIGHT TUNE IS VERY SIMPLE WHEN YOUR CONNECTIONS ARE SOLDERED WITH THE NEW

"POST SOLDERING IRON"

(The Iron with the Platinum Heating Unit). Removable Soldering Tip



1/2 Actual Size
LIST \$6.00

Designed especially to cover every requirement for delicate work. The smallest practical, efficient instrument on the market. Attaches to any socket. Universal current. Fully guaranteed. From your jobber or write

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RADIO WORLD

RADIO WORLD

1493 Broadway, New York City.

Please send me RADIO WORLD for months, for which please find enclosed \$

SUBSCRIPTION RATES:

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Six Months3.00
One Year (\$2 Issues)..... 6.00
Add \$1.00 a Year for Foreign and Canadian Postage.

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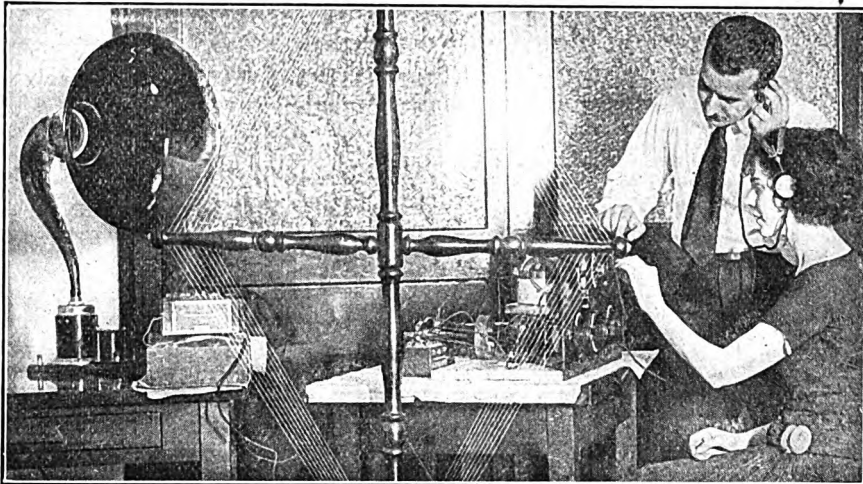
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Radio Merchandising

Classified Quick-Action Advertising, 5 cents per word

Telephone Bryant 4796

Armstrong Superregenerator in Operation



This illustration shows an Armstrong superregenerative set in operation. Durham & Co., of Philadelphia, who are specializing in this set, are the manufacturers of the 5-M.H. and 100-M.H. choke coils, also the 12,000-ohm resistances and .005-mfd. condensers used exclusively with this set for satisfactory reception.

Sell Only Tested Radio Merchandise, Says Myron M. Studner

"Many people have been greatly discouraged with the working of their radio apparatus and this was only natural, due entirely to the type of individual that has been trying to ex-

to a representative of RADIO WORLD. "The law of compensation is surely manifesting itself in this instance as in all others, and the old adage, 'Shoemaker stick to your last,' is true. An unscrupulous person or firm cannot truly make a success or produce an instrument of a standard, unless their past experiences and performances have been such that they know what they are about.

"I am glad to note that the dealers throughout the country have come to a realization that only tested and merited merchandise can be sold and that the firms and distributors are behind each and every piece of apparatus that they make. Radio reception this winter will surely be an artistic treat and delight to all people, as is quite evident by the preparations made by reputable concerns to meet the demand and give service. Success in radio reception, as well as in anything else, is a matter of intelligent selection of the proper instruments, to receive proper results. In the long run the best is usually the cheapest."

Radio Business Booming Radio Wholesaler Announces 100 per cent Increase in Business

The manager of a wholesale radio distributing company of Newark, N. J., announces that from September 1 to September 12, his firm did a larger volume of business, by 100 per cent, than during the entire month of August.

This shows the trend of the radio business.



MYRON M. STUDNER

plot this great field for personal gain rather than for the development and improvement of radio merchandise," said Myron M. Studner, designer and manufacturer of radio apparatus,

New Firms and Corporations

Notices in this department are considered as purely interesting trade news and published without compensation to us. We welcome trade news of this nature. All notices having an advertising angle are referred to our Advertising Department, and are placed under Classified Advertising at 5 cents a word, or as Display Advertising at \$5 an inch.

(The firms and corporations mentioned in these columns can be reached by communicating with the attorneys, whose addresses are given whenever possible.)

Coch & Dean, Wilmington, Del., electrical goods, \$500,000. (Corporation Trust Co. of America.)

La Flint Battery Corp., Binghamton, N. Y., \$250,000 to \$100,000.

Pacific Electric Co., Inc., Hoquiam, Wash.

Federal Telegraph Co. of Delaware, install and operate system, New York, \$2,000. (United States Corporation Co.)

Standard Radio & Electric Supply Co., Harry E. Jackson, 2208 Broadway, Oakland, Cal.

New Era Electric Shop, Inc., 5218 West 25th Street, Cicero, Ill.

Packard Electric Corp., 307 Cass St., Joliet, Ill.

Auto Electric & Radio Service Co., 28th and Harney streets, Omaha, Neb.

Broadway Electric Supply Co., 1300 Broadway Street, Detroit, Mich.

Radio Electric Co., 513 South Ervay Street, Dallas, Texas.

Southern Radio Laboratory, Harwood and Bryan streets, Dallas, Tex.

Big Radio Growth

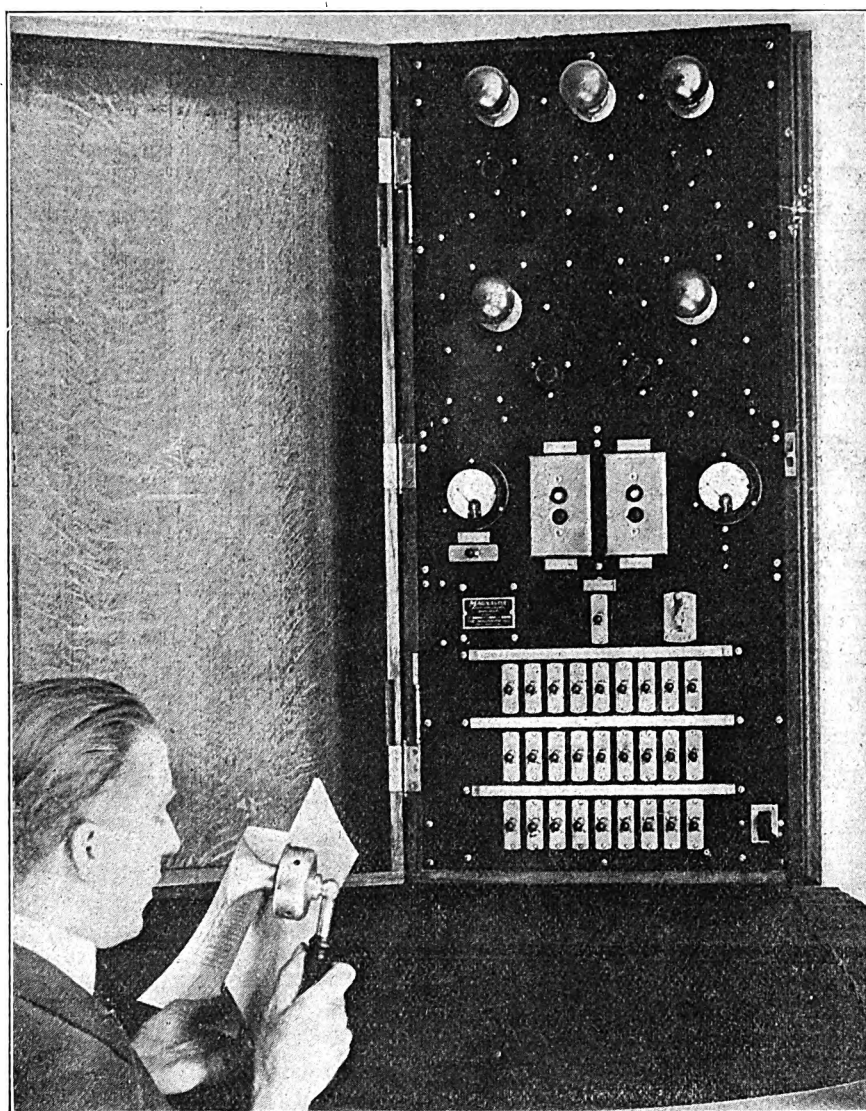
IN New York city the recent growth of the radio has been so rapid that it is estimated there are now from 75,000 to 100,000 apartments in the city equipped with receiving sets. Wireless equipment has in fact come to be considered so indispensable that plans now being made for many new apartment houses to be built in the next year or so provide radio equipment for each apartment. There will be a central receiving station connected with the apartment and in charge of an experienced radio operator, similar to the switchboard operators in apartment buildings. Radio broadcast concerts and news will be received by the central station and radiated to each apartment, which will be furnished only with a loud speaker, since all the radio instruments will be in the central radio room, where the complete tuning will be done by the expert in charge.

Fifty-two issues for \$6.00. Sub. Department, Radio World, 1493 Broadway, N. Y. C.

REPRESENTATIVES WANTED!

RADIO WORLD wants young hustling subscription representatives in every college, school, factory and big business concern throughout the country. Send us your name and address for full particulars. RADIO WORLD, 1493 Broadway, New York City.

Novel Radio Installation in Piedmont, California, High School



Principal of the Piedmont, California, High School, talking to the students in twenty-five class rooms simultaneously, through a Magnavox Telemegaphone installation. This also has a radio hook-up.

AN interesting radio installation has been completed for the Piedmont High School, Piedmont, Cal., involving a distinct improvement over present methods of inter-classroom communication. Developed by the Magnavox Company, the installation consists of a central or master station, and twenty-five receiving stations, each equipped with a No. LS-2 Magnavox Telemegaphone, the motor generator and battery being installed in a steel cabinet in the basement.

The master station is operated like an ordi-

nary telephone, as shown in the accompanying photograph. Talking into the Magnavox in ordinary tones, the speech is amplified in any or all of the twenty-five classrooms as desired in sufficient volume to be distinctly audible to all the students. This is its first application to school service. A distinctly novel feature is the fact that, by means of a special switch, broadcast lectures and concerts may be connected so as to be reproduced in any or all the classrooms by the same Magnavox Telemegaphones.

Coming Events

The editors of RADIO WORLD will gladly publish news items of all contemplated radio shows and expositions. Keep us posted by mailing full information.

ANNUAL SHOW OF THE ST. LOUIS RADIO ASSOCIATION, St. Louis, Mo., October 4 to 7, inclusive.

CHICAGO RADIO SHOW, Coliseum, Chicago, Ill., October 4 to 22. U. J. Hermann, managing director, 549 McCormick Building.

RADIO CLUB OF AMERICA. First autumn meeting will be held the last Friday in September. Renville H. McCann, secretary, Columbia University, New York.

CINCINNATI RADIO-AND-ELECTRICAL EXPOSITION, Music Hall, Cincinnati, O., October 2 to 7, inclusive.

TRI-STATE TOBACCO GROWERS' RADIO SHOW, Covington, Ohio, October 21 to 28, inclusive.

NEW YORK ELECTRICAL AND INDUSTRIAL EXPOSITION, Grand Central Palace, New York City, October 7 to 14, inclusive.

NEWARK'S SECOND ANNUAL RADIO SHOW, Robert Treat Hotel, Newark, N. J., October 4, 5, 6 and 7.

SECOND NATIONAL RADIO EXPOSITION, direction International Trade Exposition Co., Chicago, January 13 to 20, inclusive, 1923, George A. King, director of publicity, 417 South Dearborn Street, Chicago, Ill.

PERMANENT RADIO FAIR FOR BUYERS, Hotel Imperial, New York City. Open from September, 1922, to May, 1923.

AMERICAN RADIO EXPOSITION, Grand Central Palace, New York City, December 21 to 31, inclusive. Direction American Radio Exposition Company, 120 Broadway.

BOSTON RADIO EXPOSITION, AND NEW ENGLAND AMATEUR CONVENTION, Mechanics Building, Boston, October 30 to November 4, inclusive.

SPRINGFIELD RADIO EXPOSITION, Springfield Auditorium, Springfield, Mass., October 3 to 7, inclusive.

Pioneer of Radio Industry Honored



Colonel John Firth, John Firth & Company, Inc., twenty-one years in the wireless industry.

TWENTY-ONE years ago, on August 30, 1901, Colonel John Firth of the firm of John Firth & Company, Inc., engaged in the wireless industry. The event was fittingly celebrated on August 30, last, by a dinner tendered Colonel Firth by his business associates. When Colonel Firth started his business, radio was very much in its infancy. But Colonel Firth, one of the real pioneers to see its great possibilities, stuck to belief in the new science, and, guided by his vision, built up a successful business. To-day he is proud to be called a pioneer of the radio industry.

A handsome loving-cup was presented to Colonel Firth by his associates in John Firth & Company, Inc. Another remembrance came from the Democratic party of the Borough of Richmond. A number of speeches congratulating Colonel Firth were made and to which he replied.

"To-day I celebrate my twenty-first year in the wireless industry," said Colonel Firth. "It has been a most fascinating and interesting career. I am proud of the development and accomplishments my firm has made. As you gentlemen know, the industry, to-day, has become a world-wide method of communication that is speeding human endeavor ahead by years. To-day we find the world of matter a great nerve vibrating thousands of miles through a breathless point of time. Because I am a factor in the development of this huge industry makes my twenty-one years in the radio industry a period of deep appreciation and satisfaction."

Among those present were: John A. Lynch, president, Borough of Richmond; Harry Tierney, County Judge and Surrogate; C. J. Druhan, assistant corporation council of New York; T. J. Oxholm, general engineer of the Borough of Richmond; Dr. Royal Copeland, Health Commissioner of New York City, and many other prominent officials of the New York City administration.

Subscribe direct or through your news dealer. \$6.00 a year, \$3.00 six months, \$1.50 three months. Radio World, 1493 Broadway, N. Y. C.

AGENTS

Wanted in every city and town to sell radio apparatus. Good commissions. A few stocking agencies open to reliable parties.

DELANCEY, FELCH & COMPANY
13 Meeting St. Pawtucket, Rhode Island

Recommended by Dealers for Reliability

RADIO STORES CORP.

VARIABLE CONDENSERS—
PLUGS—RESISTANCE UNITS, ETC.

If your dealer doesn't carry, address Dept. D,
222 West 34th Street, New York



BUILD YOUR OWN

Complete 50c. instruction book for 20c. only on radio reception and how to make eight classes of crystal and vacuum tube receiving sets. Wonderful information makes you understand radio. With every order we send free our price list of parts prepared especially for the several sets described. Buy direct from factory and save many dollars. Both instruction book and price list sent on receipt of 20c. only. Money back if not pleased.

RADIO PARTS MFG. CO.
Dept. 15, Park Pl. W., Detroit, Mich.

CRYSTAL SET \$4

"THE LITTLE WONDER"
\$2.50 UNMOUNTED

Wonder in name and a wonder in performance. Cannot be equalled for the price. Catches distinctly everything within 25 miles.

Send for FREE catalog, describing our "Little Wonder" set and listing radio supplies.

Radi-O-Plate Panels. All sizes cut to order.

HOLLOWAY

ELECTRIC SUPPLY CO.

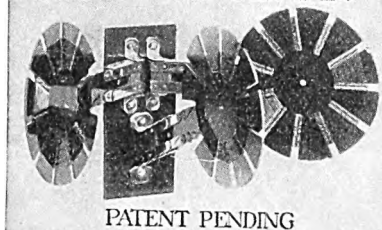
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**Tune 20 times faster—
and louder with the
ideal combination for
vacuum tube control**

**The AMPLITROL
and the
KLOSNER RHEOSTAT
model 200—see
them at your dealer's**

**KLOSNER IMPROVED
APPARATUS COMPANY**
2024 Boston Road—New York City

THE GOODMAN



The Niftiest Short Wave Tuner on the Market
Only \$6.00 & PP on 1 lb.

Send for pamphlet. Order through your dealer.

L. W. GOODMAN
DREXEL HILL, PA.

Dr. Miller, of Chicago, writes: "My perfectly good variometers and vario-coupler now go into the discard."

Latest broadcasting map 15c. That is, a complete broadcasting map appeared in Radio World, No. 8, dated May 20. Mailed on receipt of 15c. Radio World Company, 1493 Broadway, N. Y. C.

RADIO WORLD

TELEPHONE, BRYANT 4796
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1493 Broadway, New York

ASSOCIATE EDITORS:

Robert Mackay Fred Chas. Ehlert

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Fifteen cents a copy. \$6.00 a year. \$3.00 for six months. \$1.50 for three months.

Add \$1.00 a year extra for postage to Canada and foreign countries.

Receipt by new subscribers of the first copy of RADIO WORLD mailed to them after sending in their order, is automatic acknowledgment of their subscription order.

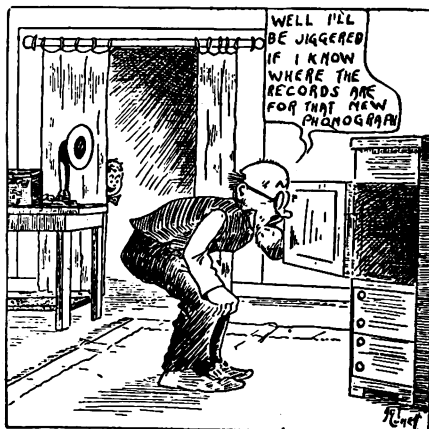
Advertising rates on request.

Entered as second-class matter, March 28, 1922, at the Post Office at New York, New York, under the act of March 3, 1879.

IMPORTANT NOTICE:

While every possible care is taken to state correctly matters of fact and opinion in technical and general writings covering the radio field, and every line printed is gone over with a scrupulous regard for the facts, the publisher disclaims any responsibility for statements regarding questions of patents, priority of claims, the proper working out of technical problems, or other matters that may be printed in good faith and on information furnished by those supposed to be trustworthy. This statement is made in good faith and to save time and controversy in matters over which the publisher cannot possibly have control.

Grandpa Can't Find the Radio Records



From "The Globe," New York

Radioman "K.O.'s" Cyclone

SAILOR JOE-JOE, otherwise Radioman Joseph H. Boyer, attached to the U. S. S. "Patuxent," now at Coco Solo, Canal Zone, has stepped into the limelight as a contender for the welter-weight championship of the Isthmus. A few days ago this radio fighter knocked out "Cyclone" Clifford, a local favorite, in the sixth round at the Coco Solo Naval Air Station. This is the first victory of a radioman over a cyclone. Nautical witnesses state that Cyclone Clifford didn't know his "code," but admit that static may have interfered. It does with most everything in the tropics.

Phenomenal!

The most remarkable thing about the rapid spread of radiophones is that it has occurred without a law forbidding it.—"The Star," Kansas City, Mo.

Subscribe for Radio World, \$6.00 a year, \$3.00 six months, \$1.50 three months.

V-A-C-U-U-M-T-U-B-E-R-E-P-A-I-R-I-N-G

Save on 1.50
Detectors

V-A-C-U-U-M-T-U-B-E-R-E-P-A-I-R-I-N-G

Save on 3.00
Amplifiers

Repairing all detectors and amplifiers using a single tungsten filament such as the following listed tubes, Marconi, Moorehead, DeForest, A. P. Electron Relay, Radiotron UV-200, UV-201, Cunninghamham C-300, C-301.

Detectors and Amplifiers repaired for \$3.50.

The repaired tubes, we warrant, will give you the same absolute satisfaction that you would expect to receive from new tubes.

We are now in a position to give guarantee for prompt deliveries with satisfactory results. A reasonable trial will confirm our reliability.

George H. Porell Co., Inc.
WEST SOMERVILLE, MASS.

GOING—and Going Fast

We have only a few left and they are going fast, but while they last we will continue to sell them at the reduced price.

VT 1 Detector and Amplifier.....\$7.50

VT 2 Detector and Amplifier.....\$8.00

The above tubes are the genuine army J's and E's, respectively.

"RADIO BUILDER" PLANS FREE!
By Mail, 5c.

LIBERTY RADIO CO.

106 Liberty Street New York City

KNOCKED-DOWN VARIABLE CONDENSER

MONEY-SAVING PRICES

An accurately made, fully efficient instrument that cannot get out of order or adjustment. Fully guaranteed. Extra heavy aluminum plates. Condensite and pieces. All other parts heavily nickel-plated. Knob and pointer included. Furnished assembled or knocked-down at the following low prices. Easily assembled by anyone following instructions furnished. Save money—order from us. Folder upon request.



No. of Plates	M.F.D. Capacity	Assembled	Knocked-down
3	.00007	\$1.75	\$1.50
11	.00025	\$2.50	\$2.00
21	.0005	\$3.25	\$2.50
43	.001	\$3.90	\$2.90

Lott's Better Radio Condenser Co.
475 ORANGE STREET NEWARK, N. J.

Radio Supplies

Variocouplers, Variometers,
Headsets, Transformers,
Sockets, Rheostats, Etc.

Guaranteed 25-Mile
Or Money Refunded PRICE, \$4

Send fifty cents for 20 efficient blue-print hook-ups.

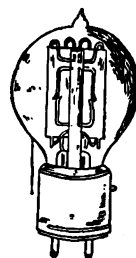
Any Radio Set Made to Order
or Repaired

Sunbeam Electric Co.

71 THIRD AVE. NEW YORK



V-T 1 at \$7.54
"J" Tube



V-T 2 at \$8.45
"E" Tube

These are the Tubes for which so many are inquiring and that are still difficult to find anywhere. There being very few of these tubes on the market, and after present supply is exhausted, more will not be available at any price, as they are to be made exclusively for the U. S. government, sure long life.

FULL LINE OF SUPPLIES. LOWEST PRICES ON STANDARD MERCHANDISE. GET OUR PRICES BEFORE PLACING YOUR ORDERS.

Amalgamated Radio Supply Co.
EXPORT AND IMPORT
193-A William Street New York City
ALERS SUPPLIED

IMPORTED DETECTOR TUBE, \$2.75

Manufacturers' Guarantee 1000 Burning Hours

This is a real \$5.00 value

43 Plate Condensers .001 Mfd.....	\$1.95
23 Plate Condensers .0005 Mfd.....	\$1.65
Jefferson Transformers.....	\$2.95
4,000 Ohms French Phones.....	\$8.00
\$5.00 Vario-Coupler.....	\$2.75
Two-Slide Tuning Coils.....	\$1.75

Mail Orders Filled Promptly
Send for Complete List of Specials

J. J. KELLEHER

14 UNION SQ. EAST

Phone Stuy. 9636

Installing a Receiver in the Bathroom

WE never felt so popular in our life as last Saturday, when a large and expectant family stood on the steps of a country house in Long Island to greet us as the week-end guest who "knew all about installing a radio set," says a writer in "The Globe," New York.

We were thoroughly confident that the anticipation would not be disappointing. The set was a good standard make, with two stages of amplification, and the house situated not more than fifty miles from Newark. So we took off our coat and went to work.

But we had reckoned without our host, who had neglected to inform us of his inadequate equipment. In common with his wide-eyed and hopeful offspring, he thought that all you did to a radio set was to set it on a table and the music would come.

We secured a battery finally from the automobile. The wire we stole, heaven knows where, removing the insulation with a ferocious looking butcher knife. Wire for an aerial was not available, unfortunately, but we had foreseen this and brought along a condenser plug.

Finally everything hooked up, set, both batteries, the plug (via two lamps connected together), we looked for a ground. None to be found. No water pipes on this floor, heat supplied by furnace or fireplace, not even a copper rod to be had. I decided to give up.

Then, looking up, we saw tears of disappointment in the eyes of the two smallest children, who had pleaded to be allowed to stay up "just to hear the bedtime story." So we carried set and batteries to the bathroom on the next floor, plugged into the light socket, again with the intervention of a lamp and cord, grounded on the water pipe, and in ten minutes were rewarded by the sight of a row of happy infants sitting on the edge of the bathtub as the voice of the "Man in the Moon" rolled in clear.

SUPER SENSITIVE SELENIUM CELLS

Guaranteed More Sensitive Than Any Other Cell.

Manufacturers' Selenium Laboratories

Live Wire Radio Co., Sole Agents
36 THIRD AVE. NEW YORK

THE BEST LITTLE
THING IN RADIO

EBY

BINDING POSTS

Place your fall orders now

Latest reductions enable us to quote attractive prices.

Corporal

Ensign "H"

H. H. EBY MFG. CO., PHILA., PA.

BUY "RITE"

Set of three rheostats, one Klossner Vernier, and two none vernier knobs to match	\$2.40
Teagle Sockets — for base or panel mounting .....	.55
Switch Lever, 50c value.....	.30
Vernier Condenser—46 Plate.....	5.90
Vernier Condenser—23 Plate.....	4.90
D. C. or S. C. Jacks.....	.48
75c. Dubilier Condenser.....	.82
35c. Dubilier Condenser.....	.28
65c. Grid Leaks .....	.52
\$4.00 Varicoupler.....	2.90
All range coupler.....	7.00
Crystal Set complete, with double ear phones, antenna, etc., ready to install	20.00

All Armstrong Parts in Stock.
Postage Paid.

Dealers write for catalogue.

RITE RADIO SHOP

Cor. 4th Ave. and Pacific St.

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Tel. Sterling 8513

Subscribe for RADIO WORLD. \$6.00 a year, \$3.00 six months, \$1.50 three months.

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V. T. SOCKET



35c each, 3 for \$1.00.
Moulded genuine Condensite.
Requires but small space
for mounting. Readily accessible binding posts. No excess metal to interfere with efficiency. Unaffected by heat of bulbs or soldering iron. Phosphor bronze contacts. Nickel plated brass binding screws. Slash cut slot. Price possible because of large production.

Special proposition for
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NOW THAT YOU ARE BACK FROM YOUR VACATION—

Be sure to see that your file of RADIO WORLD is complete. There will soon be so great a demand for back numbers that the supply will not be sufficient to cover it. RADIO WORLD has been issued every week from April 1 to date (22 numbers up to August 26th issue). Mail, postpaid, for 15c a copy; any seven copies for \$1.00. The first 22 copies sent on receipt of \$3.00. Or send \$8.00 for one year (52 issues) and have your sub start with No. 1.—RADIO WORLD, 1493 Broadway, New York City.

CASTINGS

BRASS, BRONZE, ALUMINUM

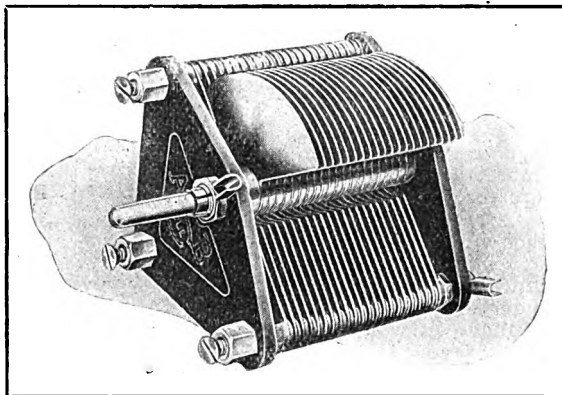
Our Motto "SERVICE"

THE ANCHOR BRASS & ALUMINUM CO.

Ninth and Freeman Sts.

CINCINNATI, OHIO

A LABORATORY QUALITY CONDENSER



MADE OF THE BEST MATERIALS

BY

MEN WHO KNOW HOW

BULLETIN
ON
REQUEST

A. B. COLE, INC.

88 East Kinney Street, Newark, N. J.

Spirola Concert Complete With Unit

TRADE MARK PATENT PENDING

The only way to really enjoy radio music is to use V. I. amplification and a LOUD SPEAKER.

Listening in with head phones is all right as a novelty, but no one who has ever used a real loud speaker outfit would ever go back to the phones. It would be like going back to one of those ancient phonographs where you had to listen with rubber tubes to your ears.

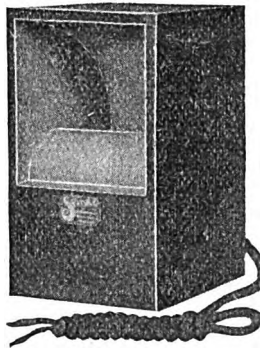
BUT—many people have gotten the idea from the radio "music" they have heard on the street that loud speaking means distortion—a blaring, raucous sound, lots of NOISE but not much music. This idea is entirely wrong. SPIROLA CONCERT reproduces radio music with absolutely NO distortion or tinny, blaring quality and with a minimum number of stages. Two stages of amplification are sufficient under almost all conditions to bring in the music clear and strong and as natural as life—one stage is enough within twenty miles or so of a large broadcasting station.

These are not mere advertising claims. We back them up with an absolute guarantee. If you wish to return your SPIROLA for any reason whatsoever, do so within ten days and your money will be immediately refunded.

Beautiful cabinet type, choice of either mahogany or dark oak finish, with bronzed throat, complete with cord, ready to hook up—no "units" or other extras to buy—at your dealers or prepaid anywhere in the U. S., Canada or England—\$12.50.

MADE AND SOLD BY

L. H. DONNELL MFG. CO.
Dept. B, Box 70, Ann Arbor, Mich.



"Spirola Speaks"

YOUR PHOTO IN THIS PAPER ATTENTION AMATEURS!

Have you built your own receiver?

Are you experimenting with any particular hook-up?

Are you improving your set?

Are you doing any interesting constructive work in radio?

Why not share this knowledge with your thousands of brother fans who read RADIO WORLD every week?

We want pictures of receiving sets with descriptions of how you overcame some difficulty or any additional part or unit that you have added to obtain better results. These are the things that, probably, the other fellow is looking for. Send in your information; pictures or whatever you have done to improve the art.

Address Technical Editor

RADIO WORLD, 1493 Broadway, New York City, N. Y.

Remember the beginner is looking for them.

We intend to print on this page, each week, pictured information and description of value to radio amateurs. If you have found a newer or better way of doing anything, don't keep the secret but tell it to your thousands of brother fans.

Send in a photograph of your set with or without accompanying diagrams and measurement. State whether you figure in the picture yourself, or not, and without any expense whatsoever to you we will make an engraving and publish it. Be sure to write your name and address plainly on photograph.

Send in your picture at once, or if you have not made a set or done anything else in making radio material, tell the boy next door all about this offer.

Radiogleanings

WIRELESS signals are most easily perceptible and loudest at that point on the earth farthest from the station sending the message.

* * *

Use the same kind of wire for stringing up your insulators that you use for the antenna itself. Rope will stretch and shrink with the changes of weather and will cause the antenna to sag and tighten up. This strain may cause the wires or the rope to give way.

* * *

Although Radio Central, Riverhead, L. I., can talk to Wales, France, Germany, or Norway with ease, Riverhead can listen simultaneously to messages from all those countries. At the same time it can close its "ears" to the powerful impulses sent out only a few miles away by the giant Radio Central, and is able to eliminate 90 per cent of atmospheric disturbances.

* * *

U. S. Signal Corps officers estimate that radio has saved hundreds of hours in time, as well as thousands of dollars, since its installation.

* * *

The B battery, if left in a damp place, will be found to be useless for radio purposes. Actual use takes less from a B battery than half the time spent in damp inactivity.

* * *

B battery is extremely fragile. It is true that it appears solid and bricklike, but it must nevertheless be handled almost as carefully as a watch.

* * *

When building a loop, make it as large as conveniently possible, as a large loop with a small number of turns will give better results than a small one with a greater number of turns. The average size ranges from three to four feet square. For short wave use a four-foot loop should have from four to six turns.

* * *

A crystal detector will give excellent results on your antenna and a range of about twenty-five miles.

* * *

When a radio set is not operating correctly it is analogous to the human body when ill. It has symptoms which tell a story to the doctor, who understands their meaning and knows how to remedy the condition. So it is in radio. Each objectionable sound is a symptom telling a story which can best be interpreted by practical experience, enabling the radioman to understand the meaning and rectify the trouble by adjustment of the instruments.

* * *

Cross wires as seldom as possible; keep them well separated where they cross; keep them as short as possible; have them well insulated and make good connections.

* * *

When connecting a new, complicated and unfamiliar hook-up it is a wise radio fan who leaves one B battery terminal open until the last connection has been made. Then by placing most of the filament rheostat in the circuit and cautiously completing the B battery connection any high voltage in the delicate filament will be detected before the tubes are burned out.

* * *

It is a mistake to rate phones entirely by their ohmage, as the sensitivity is only indirectly dependent upon this factor. A high ohmage could be obtained by winding the receiver magnets with resistance wire, but if this were done the phones would be very insensitive indeed. This system of valuation is about as good as a system that determined the worth of a man by his weight in pounds.

Standard the World Over



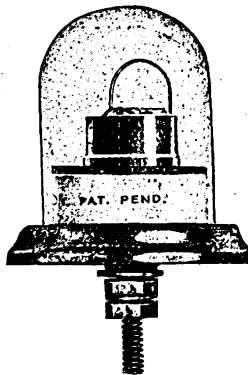
The Phone with the adjustable pole pieces that can be used on any stage of amplification or will receive the most sensitive signals.
Guaranteed to be equal of any phone on the market listing at \$8.00.

PRICE \$5.75

If your dealer cannot supply you write direct. One dollar at least must accompany each order. Balance C. O. D.

Dealers and jobbers write.

Standard Electric Sales Co.
843 Broad Street Newark, N. J.

The FAMOUS GREWOL
FIXED DETECTOR

PRICE \$2.00

OPERATES WITHOUT BATTERIES.

In using the

GREWOL

you don't have to find the spot.

**THIS DETECTOR IS
ALWAYS SET AND READY**

completely protected from dust.

Gives the best results.

If your dealer does not handle the Grewol send us \$2.00 and we will mail one to you.

WRITE FOR OUR TRADE
PROPOSITION

RANDEL WIRELESS CO.
9 Central Ave. Newark, N. J.

Practical Instructions for
Erecting Aerials

THE most common cause for the non-reception of signals, or even weak signals, is due to the improper erection and construction of the aerial with a proper lead-in. It must be remembered that lead-in wires bring the signals from the aerial to receiving set. If a few simple rules are carried out when the aerial is being put up, it will guarantee proper reception of the wave energy and conduct it cleanly to the receiving set.

A No. 14 wire, either solid or stranded, 100 to 150 feet long, may be used. It will be sufficient to receive wave lengths from 150 to 800 meters. Copper wire or phosphor bronze gives the best results. I would not recommend that any other wire be used. This wire may be made into one aerial with a horizontal length of 100 feet, or into a two-wire aerial 40 to 50 feet long with the rat-tail, or lead-in, brought down from one end. In all cases, if any means can be employed to erect the aerial in one length, far greater results may be had than with a two-wire aerial. The aerial should be supported between two masts, or poles, preferably 20 to 30 feet above the roof. It is always a good plan to have your aerials as high and as long as possible.

Another important factor: when connecting or making joints at lead-in wires, be sure to solder all connections

Handy Tool Kit for Radio

- 1 pair 5-inch long-nose pliers.
- 1 pair 5-inch side-cutting pliers.
- 1 pair 8-inch diagonal pliers.
- 1 12-inch medium screwdriver.
- 1 4-inch small screw driver.
- 1 jeweler's screwdriver.
- 1 hand drill.
- 1 set of twist drills.
- 1 small hammer.
- 1 pair small gas-pliers.
- 1 reamer.
- 1 roll of rubber tape.
- 1 electric soldering-iron.
- 1 rosin solder.
- Half pint of killed muriatic acid. (Never use soldering paste).
- 1 hack saw.
- 1 small vise.
- 1 small file.
- Sandpaper of various sizes.

RADIO INSULATION

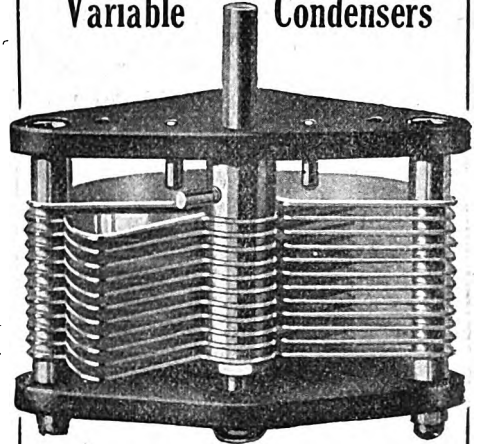
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COMPOUNDS—PAPERS—ETC.

ESTABLISHED 1889

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MITCHELL-RAND MFG. CO., 24 Vesey St., N.Y.

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Variable Condensers



These condensers are the
Standard of Quality.

3 Plate Vernier \$1.50
23 Plate \$4.00
43 Plate \$5.00

Sent prepaid on receipt of price.
Special discounts to Radio Clubs.

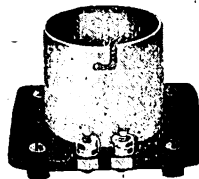
Jobbers and Dealers write.

Frederick H. Pruden, Incorporated

LERNER BUILDING
993 BERGEN AVENUE
JERSEY CITY, N. J.

If you did not get a copy of Radio World No. 1, send us \$6.00 and we will send you this paper for one year, and start it with our first issue, which will be mailed you as soon as possible after receipt of order.

Teleradio



The Teleradio Tube Socket
Whose handsome design is adapted for table or panel mounting. Of shell-drawn aluminum. All parts perfectly insulated—legs are not current-carrying. Terminals plainly marked.

List Price, 60c



2,000 Ohms, \$6.50

2,200 Ohms, \$7.50; 3,000 Ohms, \$9.00
Each

Teleradio Supersensitive Headsets equal the performance of phones selling at \$12.00 and \$15.00.

If your dealer has not stocked Teleradio Products write us direct
DEALERS and JOBBERS write for our PROPOSITION

OTHER TELERADIO PRODUCTS

Variable Condensers, 3, 11, 23 and 43 Plates, list prices are \$1.50, \$2.50, \$3.00 and \$4.00, respectively. Filament Protectors, 60c. Fixed Phone and Grid Condensers, 35c each.

TELERADIO ENGINEERING CORPORATION

484-490 BROOME STREET

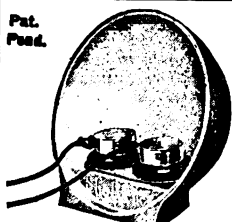
NEW YORK

Rocky Mountain Crystals

BETTER THAN GALENA
The most sensitive mineral rectifier known. Can also be used with one or more stages of amplification.
Mounted, 35c.; Unmounted, 25c.; Postpaid
Manufacturers, Jobbers, Dealers, Clubs,
Apply for Special Trade Prices
Rocky Mountain Radio Products, Inc.
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6900 RETAIL RADIO DEALERS covering the United States, by states, price per thousand\$7.50
888 Radio Manufacturers, per list.....10.00
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These are neatly typewritten and ready to send on receipt of remittance covering the amount. Guaranteed 98% correct.
TRADE CIRCULAR ADDRESSING CO.
165 W. ADAMS STREET CHICAGO, ILL.



SHELTONE
LOUD SPEAKER
No tubing or horn to distort delicate notes. Swells every sound into full richness!
SHELTONE CO.
26 Clinton Street
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\$5.00 AT ALL GOOD DEALERS
OR DIRECT BY MAIL

"MIRAD"

"Quality Radio Priced Right"

3 Plate Variable Condensers.....\$1.50
Mirad Varicouplers.....3.75
3000 Ohm Double Head Phones.....6.00
1500 Ohm Single Head Phone.....3.00
(Money back guarantee.)
Mirad 23 Plate Condenser.....3.35
Mirad 43 Plate Variable Condenser.....4.95
Mirad Detector Unit.....36.00
Mirad Two-Step Amplifier.....25.00
Postage Paid

Dealers' Sample of Above 25% Off

Miracle Radio Mfg. Co.
INTERURBAN BLDG., DALLAS, TEXAS

GENUINE

MYERS'
AUDION
HI-MU TUBES

\$4 each

1 or 100 at this price so long
as my stock lasts.

All original tubes in original packages
direct from the Myers Laboratory

GEORGE A. SIMMS'

18 WEST 34th ST., NEW YORK
Room 71

Mail Orders Filled on Receipt of Cash

Latest broadcasting map 15c. That is, a complete broadcasting map appeared in Radio World, No. 8, dated May 20. Mailed on receipt of 15c. Radio World Company, 1493 Broadway, N. Y. C. (Adv.)

Over 500 Broadcasters Licensed

TOTAL broadcasters licensed up to September 9 numbered 502, of which ten were licensed during the past week. Since the licensing of the first broadcaster in September, 1921, only 16 have withdrawn or dropped out, and altogether the number of licenses granted per week has been decreasing recently, there is no indication that many of the stations are contemplating a cessation of their activities.

It is natural that the licensing should decrease slowly, for the saturation point is being approached. There are stations in all but one State and in practically every city of importance; too many, unfortunately, in some cities, so that they frequently interfere with one another. With the new regulations, depending upon legislation, granting broader bands for broadcasting, however, it is hoped that better and far more efficient service may be rendered. The establishment of class B stations on a 400-meter wave, for the stations which can qualify, will also improve the situation.

The new stations are as follows:

WNAD—Atkinson County Mail, Rockport, Mo.

WKAY—Benau College, Janesville, Ga.

WKAX—Wm. A. Facfarlane, Bridgeport, Conn.

WLAC—North Carolina State College, Raleigh, N. C.

WLAH—Samuel Woodworth, Syracuse, N. Y.

WLAO—Anthracite Radio Shop, Scranton, Pa.

WLAM—Morrow Radio Co., Springfield, Ohio.

WMAB—Radio Supply Co., Oklahoma City, Okla.

KFCC—Auto Supply Co., Wallace, Idaho.

WMAJ—Drovers Telegram Co., Kansas City, Mo.

KFBQ—Savage Electro Co., Prescott, Ariz.

WLAL—Tulsa Radio Co., Tulsa, Okla.

KFCB—Nielsen Radio Supply Co., Phoenix, Ariz.

WLAG—Cutting & Washington Radio Corporation, Minneapolis, Minn.

WKAZ—Landaus Music and Jewelry Co., Wilkes-Barre, Pa.

Typewritten Letters Radioed from the Sky

NO reason at all why an aviator, in a modern stable plane, should not carry a typewriter and write a story of his journey while in the sky, writes Henry Smith Williams in "The American," New York. But now comes the remarkable part of the story. For it appears that our present aviator, as he manipulates the typewriter there in the airplane, is writing a message that is typed out, letter by letter, as he clicks the keys, on a strip of paper that is miles away from him at a radio-receiving station on the ground. Word by word and sentence by sentence the record of his observations is being made in ordinary typed characters and read by the person who is operating the receiving apparatus. There is no mysterious code involved. The message is as easy to read as any other typewritten letter. The apparatus involved is called a "radio teletype."

The principle on which it works is not very mysterious—except as all electrical phenomena are mysterious—although its application is highly ingenious. Each bar of the typewriter, as the key is touched, makes an electrical circuit which releases a modicum of energy and sends out a radio wave of particular type. At the receiving station on the ground, as arranged, the typing apparatus receives the radio energy and interprets it selectively, letter by letter, to correspond with the transmitted message.

The navy officials declare that the new achievement furnishes a means of communication far in advance of any radio telegraph and telephone systems hitherto in use. Its advantages are obvious enough, even to the layman. The next step, presumably, will be to combine the teletype apparatus with a telephoto apparatus, so that the aviator may send an illustration—for example, a picture of a fortification or line of battle—along with his written description.

To many anxious inquirers: **RADIO WORLD** has no free list. One copy is sent as a voucher to each advertiser or advertising agent represented in current issues. All other copies are paid for on subscription or through the news trade.

RADIO BOXES

All radio carpentry work our specialty. Write for

SPECIAL PRICES

JOE MIFSUD & CO.

373 Canal Street New York City
Telephone—Canal 9475

Superior Radio Products

All Parts, Receiving Sets Complete and in Units. Send for Description and Prices. Prompt Shipment on Mail Orders.

Dealers Write for Proposition

RADIO OUTFITTING CORP.

Mfg. High Grade Radio Apparatus
410 East 34th St. New York, N. Y.

LOWEST PRICES

FORMICA RADIO PANELS

\$/16 in. thick, cut to size, per sq. in.	2a
MAGNET WIRE, per 1/2 lb. Spool	
B.A.S. Gauge	Enam. 2 G.C. D.S.C.
22	\$0.40 \$0.68 \$1.22
24	.48 .79 1.41
26	.54 .96 1.78
28	.58 1.13 2.00

HUGHES ENGINEERING CO.

P. O. Box 87 Terrace Park, Ohio

DRIVE 100 TACKS AND SAVE \$25.00

Ford Roadster Top Re-covering \$5.20. Touring \$6.95. and \$9.95. Chevrolet, Dodge or Maxwell \$13.95. All other 5 passenger cars \$16.50 with plate glass lights. Regular Side Curtains \$5.95 up. Special Winter Side Curtains that open with doors \$11.90 up. Ford Seat Covers \$3.15 up. Ford Cushions \$5.75. All goods same as car mfrs. use. Quality the best and guaranteed to fit. Printed instructions given how to apply. Send for samples. Prices above include delivery at your door.
AUTO EQUIPMENT CO., 37 Canal Street, Cincinnati, O.

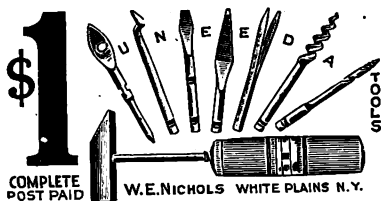
Pictures and Facts About Armstrong Amplifier

Radio World has published a number of pictures, diagrams and descriptive articles regarding the New Armstrong Super-Regenerative Amplifier. The numbers containing this material are dated June 24, July 8, July 15, and August 5. They will be sent postpaid on receipt of 15 cents each, the four copies complete for 60 cents. Or you can subscribe, \$6.00 year; \$3.00, six months; and have your subscription start with the number dated June 24. **RADIO WORLD CO., 1493 Broadway, New York.**

A Fitting Birthday Present for Those Interested in Radio

Are you cudgeling your brain in an effort to think of an appropriate present for a relative or friend? If that relative or friend is interested in radio, **WHY NOT SEND HIM OR HER RADIO WORLD FOR THE COMING** twelve months? Send us \$6.00 for each subscription you want, and we will place the names on our subscription list for one year, postpaid, and we will also send special cards to the addresses you send us announcing that the subscriptions were sent with your compliments.

Address Subscription Department, Radio World, 1493 Broadway, New York City, N. Y.



Law Storage Battery

Constant voltage, large amperage. Will run two months without recharging.
Attractive Dealers' Discounts
Write for Details

WILLIAM LAW COMPANY
Aborn and Sabin Streets, Providence, R. I.

Welcome! Come in and hear the

Coraco

Radio Concert

Daily, 9 A. M. to 5 P. M.
18th Floor, 229 W. 42nd St., next to
Amsterdam Theatre

The Coraco Super-Radiophone is the latest and greatest improvement in radio. It has no outside connections—no installations expense—is as simple to operate as a phonograph. If you cannot call, write for full information.

The Coraco Company, Inc.
220 West 42nd Street New York

GITHENS TRUTONE RADIO HORN—LOUD SPEAKER



First one to sell
on ten day trial
Money back
Guarantee

Retail Price

\$21.00

Includes

Loud Speaker

Trutone has been pronounced the best on the market by experts. It has a clear true tone. Every radio fan should try Trutone and compare it with others.

If YOU don't find Trutone the best, your money will be refunded. It is sold on a ten-day trial money-back guarantee. If not carried by your dealer write us.

Distributors and Dealers, write!

AUTO PARTS MFG. CO.

1815 Trombly Ave., Detroit, Mich.

NOVO "B" BATTERIES FOR RADIO

22½-45 & 105 VOLTS



**NOISELESS
DEPENDABLE
GUARANTEED**

ASK YOUR DEALER

NOVO MANUFACTURING CO.

424-438 W. 33rd ST.

NEW YORK
531 SO. DEARBORN ST., CHICAGO.

High-Frequency Amplification and the Crystal

HOW successfully can a crystal detector be used for receiving broadcast music and entertainment after the incoming wave has been subjected to high frequency amplification? asks a writer in "The Tribune," New York. To solve this question a series of extensive experiments were conducted during the week in our new laboratory.

The results of these tests emphasize that it can be done successfully within limitations. So far we have not been able to obtain success with more than one stage of radio frequency amplification ahead of the crystal. All attempts to go beyond one stage have resulted in material reduction of signal strength.

In order to approximate the most adverse conditions the test was made with a single wire indoor aerial, consisting of fifty feet of No. 18 cotton covered annunciator wire. This wire was stretched in a room on the fifteenth floor of a steel-construction building, where the worst shielding effect is met. During the experiments first one stage of radio frequency amplification was employed, then two, and finally three stages.

In order to reduce the circuit to its simplest form the tuning element in the aerial consisted of an ordinary standard short-wave variometer directly connected to the aerial and ground. The amplifying tubes were of the UV 201 type, and the high frequency transformers of the R. T. 1 type.

In operation it was found that the circuit was particularly steady so long as no more than one stage was employed, and moreover it was very selective, far more so than in the case of the ordinary crystal set using a double tuning circuit. In fact, it was so selective that the slightest turn of the variometer rotor threw out the broadcasting station, and as a consequence it was found advisable to use a vernier attachment on the dial of the variometer in order to make minute adjustment of it. Interference from wireless telegraph stations was at a minimum.

Who Is This Broadcaster?

HERE is a real radio mystery. What station could possibly be sending out a bedtime story at 1 o'clock in the morning, and then announce that the regular program for the evening would be continued? It has puzzled two of our readers, says "The Tribune," New York: Harry S. Colins, of 2AJW, and Dunbar B. Adams, of 2ASH. Can any one help them identify the station? Here are the facts:

"On the night, or rather the morning of August 16, at 1 o'clock, E. S. T., while tuning about for any possible radiophone stations, picked up one on the usual broadcast wave.

"'Little Red Riding Hood' was being given for the kiddies, in a woman's voice, after which followed the announcement, in a man's voice, to the effect that the regular evening program would be continued.

"We then listened to several selections and then foolishly shut down without being able to identify the broadcasting station.

"By a process of elimination we decided it must be KYDX, at Honolulu, Hawaii, and accordingly cabled them. The answer was in the negative.

"This reception was done on a Paragon R. A. 10 detector, one stage of audio frequency, and the Western Electric No. 10A loud speaker—an additional two steps of audio but no frequency—owned by Mr. Dunbar B. Adams, of Bayshore, L. I., Radio 2ASH.

"We are very desirous of learning the identity of this station, and will greatly appreciate your help in the matter."

52 Weeks for \$6.00

Complete Your File of RADIO WORLD
Copies of Radio World No. 1

PATENT
Your Radio Ideas.
Call or Write
FREE ADVICE

ASK MANUFACTURERS
FOR PATENT CO.
520 FIFTH AVE
NEW YORK

The Nelson Radio Parts Co.

Manufacturers and Distributors of

RADIO APPARATUS

Write for Catalog.

89 ACADEMY STREET, NEWARK, N. J.
Tel. Market 4066

ALADDIN ELECTRIC COMPANY, INC.

COMPLETE RADIO SETS

WRITE FOR PRICES.

71 West Broadway New York City

MEYER TUBES AND CHOKE COILS

Radio Accessory Products

Dealer and Manufacturer of Radio Apparatus

Complete Radio Installations

219 Greenwich Street N. Y. C.

Buy Your Radio Receiving Set at Manufacturers' Cost

Buy your Radio Supplies at a large discount below the list or retail price. If a saving of \$15.00 to \$140.00 on a Radio Receiving Set or if a saving of 25% to 40% on Radio Supplies interests you, write or telegraph us today.

KING RADIO MFG. COMPANY
521 Penn Ave. Wilkensburg, Pa.

COMPLETE RADIO SET

READY TO LISTEN IN

\$14.50

C. O. D.

FOR THE COMPLETE SET.

INCLUDING AERIAL

(Regular price: \$35)

This outfit is intended

for the fan that appreciates

a good thing. It includes

a high grade tuner with a 40 to 60 mile range,

1200 ohm phone, insulators, and complete aerial set.

SEND NO MONEY unless you wish. Simply send

us your name and address, and we will mail immediately.

You pay Postman on arrival, our price, plus postage.

Satisfaction guaranteed, or money refunded.

THE UNWIN TRADING CO.

55 BROADWAY NEW YORK

HOMCHARGE YOUR RADIO BATTERY for a Nickel

ENJOYABLE Radio Concerts and Maximum Receiving Range are obtained only when your battery is fully charged.

THE
RADIO
HOMCHARGER
DE LUXE

charges your "A" or "B" battery over night. Silent and clean in operation—requires no watching—may be used right in your living room.

Connects to any lamp socket. Self-polarizing—fully automatic—cannot overcharge or injure the battery.

Entirely enclosed—approved by Underwriters. Unconditionally

GUARANTEED. Lasts a lifetime.

Beautifully finished in Mahogany and Gold—the most efficient and

handsome recharger ever produced. Sold by all dealers, \$18.50

complete. Send for Bulletin 637. IT'S FREE.

THE AUTOMATIC ELECTRICAL DEVICES CO.

135 West Third Street

Cincinnati, Ohio



Over 50,000 HOMCHARGERS in Use

DO YOU WANT TO BUY, SELL OR EXCHANGE RADIO OR OTHER GOODS? TRY THIS
DEPARTMENT AT 5c A WORD

RADIO WORLD'S QUICK-ACTION CLASSIFIED ADS

This department is intended for everybody who wants quick action on short announcements covering the buying, selling, exchanging or general merchandising in the radio field. Readers of RADIO WORLD will find that it pays to read these columns every week. Advertisers will get a ten-day service here—that is, copy received for this department will appear in RADIO WORLD on the news-stands ten days after copy reaches us.

The rate for this RADIO WORLD QUICK-ACTION CLASSIFIED AD. DEPT. is 5c. per word (minimum of 10 words, including address), 10% discount for 4 consecutive insertions, 15% for 13 consecutive insertions (3 months). Changes will be made in standing classified advs., if copy is received at this office ten days before publication. RADIO WORLD CO., 1493 Broadway, N. Y. C. (Phone, Bryant 4796.)

RADIO CRYSTALS. 10 Varieties, tested, \$1.00. Harlem Radio, 2124-7th Ave., N. Y.

HOOKEUPS: Over 100 blueprints to select from at 10c. each. Send dollar for trial order. Radio Supply Co., Box 192, Pueblo, Colo.

PATENTS—Electrical cases a specialty. Pre-arranged charges. B. P. Fishburne, Registered Patent Lawyer, 386 McGill Bldg., Washington, D. C.

DON'T BUY A BICYCLE MOTOR ATTACHMENT until you get our catalog and prices. Shaw Mfg. Co., Dept. 71, Galesburg, Kan.

Manufacturers of Rogers Radio Receivers and Rogers Receiving Radiometers. Rogers Radio Company, 5133 Woodworth Street, Pittsburgh, Pa.

TO THE TRADE—Fixed Phone and Grid Condensers. Write for price list and sample. SALKEY RADIO CO., 2378 Eighth Ave., New York City.

Exchange jolly interesting letters through our Club! Stamp appreciated. Betty Lee, 4254 Broadway, New York City.

PATENTS—Send for form "Evidence of Conception" to be signed and witnessed. Form, fee schedule, information, free. Lancaster & Allwine, 259 Ouray Bldg., Washington, D. C.

Triple mounted SHAMROCK CRYSTALS—50 cents—galena, silicon and iron pyrites mounted in one. Will fit any standard detector cup. Tested and sold under replacement guarantee. Mailed to any address on receipt of price in coin. Bathgate, 120 Autumn St., Passaic, N. J.

RADIO ENGRAVINGS FOR SALE—We have a large stock of radio half-tone and pen-and-ink reproductions which are suitable for magazines, illustrations, booklets, circulars, advertisements, etc. Tell us what you want and we will quote rates. R. W., Room 326, 1493 Broadway, New York City.

CASH FOR OLD GOLD. Platinum, Silver, Diamonds, Liberty Bonds, War, Thrift, Unused Postage Stamps, False Teeth, Magneto Points, Jobs, Any Valuables. Mail in today. Cash sent, return mail. Goods returned in ten days if you're not satisfied. OHIO SMELTING CO., 337 Hippodrome Bldg., Cleveland, Ohio.

CABINET mounted, honeycomb regenerative set, complete, \$48.00. Fred Reichert, Hudson St., Hawley, Pa.

PATENTS

Protect your invention today. Write for 1922 Illustrated Book Free. Radio, Electrical, Chemical and Mechanical experts. Over 30 years' experience. A. M. Wilson, Inc. (Radio 3 ARH), 310-18 Victor Building, Washington, D. C. (Successors to business established 1891 by A. M. Wilson.)

Dealers and Salesmen wanted to handle Shamrock Crystals. See other ad. Good proposition to dealers. Send 50 cents for sample. Bathgate, 120 Autumn St., Passaic, N. J.

TEN PER CENT OFF ON RADIO SUPPLIES. Write for prices now. Don't put it off! Switch Points, 2c.; Detectors, \$4.50; Amplifiers, \$5.75; Westinghouse R. C., \$119.25. Palmer Radio Company, Navasota, Texas.

FOR SALE. Grebe CR-8 and 2 step amplifiers. Irvin Maurer, Minersville, Pa.

EDISON "B" Battery Elements, 10c. pair. 1KM 181 Pleasant St., Malden, Mass.

BOYS! MYERS' HIGH-MU AUDION. A tube which brings in the stations five times louder than other tubes. May be used as audio or radio frequency amplifier. Try one of these excellent vacuum tubes. \$5. Receptacle, \$1. Postage and Insurance free. If unsatisfactory, return within five days after receipt. The Kehler Radio Laboratories, Abilene, 50, Kansas.

WANTED: COPIES OF RADIO WORLD, April 22 and May 20, 1922. Mail us copies of these issues, or either one, with an accompany postal and we will send you a copy of the latest issue for each copy so mailed. RADIO WORLD, 1493 Broadway, New York.

25 WATT C. W. and phone set including motor generator, 5 tubes, new, used less than 20 hours. Cost over \$250; sell \$175,000 cash. Box 152, Mahwah, N. J.

WESTINGHOUSE RC Regenerative Receiver and 2 stage amplifier in cabinet, \$75; 1-6 HP. 10 Volt DC Motor-generator, \$15; 5 Ampere Battery Charger, \$8. Further details on request. A. R. Leinbach, 137 Walnut St. Reading, Pa.

TUNING COILS, single slide, \$1.00; double slide, \$1.25. Bases finished in Blackrite. 6x6, 25c.; 6x14, 45c. Include postage. J. Zied, 530 Callowhill St., Philadelphia, Pa.

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EARN \$110 to \$250 Monthly, expenses paid, as Railway Traffic Inspector. Position guaranteed after 3 months' spare time study or money refunded. Excellent opportunities. Write for Free Booklet G-151. Stand. Business Training Inst., Buffalo, N. Y.

THE LOOP'S THE THING. The coming aerial, most simple and inexpensive of all when our blue prints and specifications of the two better types are followed. Sent postpaid for \$1.00. No stamps. McGhee Development Co., Box 1337, El Paso Texas.

"GLORADCO" RECEIVING SETS. Tuner, detector and two step amplifier, made of standard parts in mahogany cabinets, \$55.00. Made to sell for \$85.00. Globe Radio 402 East 148th St., New York.

WISCONSIN Galena Crystals, 2 oz. 50c. Ready now. Sent postpaid, A. E. Beers, Beetown, Wis.

RADIO FANS! Send for our catalogue of Electrical, Radio and Mechanical books. Includes radio outfits and amplifying transformers. Prices reasonable. A. C. URIE & CO., 333 W. Manhattan Boulevard, Toledo, Ohio.

DO YOU USE A CRYSTAL DETECTOR? ARE YOU MAKING A CRYSTAL RECEIVER? Increase the efficiency of your crystal detector 1,000 per cent by using a "PT" Ultra-Sensitive Contact. Of special gauge and alloy. Makes and holds a quick, ultra-sensitive, stable adjustment. Using galena, you may pound panel or table without disturbing sensitivity in slightest. Proved practical on shipboard by an old-time Marconi operator. Using a "PT" Contact on galena, Arlington (NAA) was brought in clear at 3,300 miles (below the Equator); and Arlington came in loud at 2,200 miles (off Dutch Guiana). In both instances, nearby ships using vacuum tubes were unable even to hear NAA. As to stability, Cape May (WCY) was worked over 1,000 miles, sending right through crystal with 2 KW spark, without affecting detector's adjustment. Replace your old insensitive unstable contact with one which will hold its adjustment in addition to giving louder signals and music. Indispensable for pocket sets and crystal detector-bulb amplifier outfits. A novice can install. "PT" Ultra-Sensitive Detector Contact, with instructions, twenty-five cents coin or M. O. "PT" CRYSTAL CONTACT CO., Box 1641, Boston 8, Massachusetts.

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Axioms for Radio Inventors

THE following axioms regarding inventions and patents proved to be useful to inventors and prospective inventors:

1. An invention belongs to anyone until patented.
2. Unpatented ideas are not profitable.
3. The simplest ideas have often resulted in the greatest good and most profit.
4. The fruit of one's mind shall be protected as well as his personal property.
5. A patent secured through reliable patent attorneys is a guarantee and protection against infringement.

If an inventor of a commercial article does not succeed in the radio field it is due to one of the following three reasons:

1. Failure to patent his invention.
2. Failure to receive adequate protection.
3. Failure to place his invention before the public.

It Will Not!

Wonder if the radio craze will develop wireless wire-tappers—"Gazette-Times," Pittsburgh.

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95 Westminster St. Providence, R. I.

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A name in Radio that sets a new standard for Quality, Workmanship and Service. An organization of experienced radio men that have been conservative rather than impulsive.

In a business that has been literally "talked to death," a business that has been greatly damaged in public respect and support by insane publicity and ignorant merchandising methods, our organization has had the sense to work hard, use its intelligence and keep its mouth closed tight.

Now, for the first time in over seven months, we make our first announcement to the jobbers and dealers of the country—of the best products on the market, giving maximum satisfaction and service—at the right prices. That is why you will find the best radio jobbers and dealers featuring our

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"The Seal of Quality"



JUN 24 1926

